ENG
10/2012

De Dietrich C230 ECO-A Series

Gas-Fired Condensing Hot Water Boiler

Models

- **C230 ECO-A 80**
- **C230 ECO-A 120**
- **C230 ECO-A 160**
- **C230 ECO-A 200**

Installation, Operating and service manual

Important
This is a category II or IV boiler, only use an approved type 'BH' vent or equivalent, consult the venting section in this manual.

Warning: Before you operate this boiler, read this manual carefully and take extra precautions to all safety and warning symbols or important items. The installation and service manual is part of the documentation along with the boiler. The installer is required to explain your heating system and boiler operating instructions.

Notice: Please read this manual and retain for future reference. Improper installation, adjustment, alteration, service or maintenance can cause injury, loss of life or property damage. Refer to this manual for assistance or additional information or consult a qualified installer, service agency or the gas supplier.

De Dietrich BOILERS

Table of contents

Preface

This installation and service manual, which contains a lot of practical information about the De Dietrich C230 ECO-A, a High efficiency central heating unit, is mainly intended for installers. It contains important instructions for safe and trouble-free operation of the boiler before commissioning and during operation.
Read these instructions carefully before putting the boiler into operation, familiarize yourself with its control functions, operation and strictly observe the instructions given. Failure to do so may invalidate warranty or prevent the boiler from operating. The following boiler models are available:

- C230 ECO-A 80 (3 sections; 297 MBH (87 kW))
- C230 ECO-A 120 (4 sections; 359 MBH (105 kW))
- C230 ECO-A 160 (5 sections; 567 MBH (166 kW))
- C230 ECO-A 200 (6 sections; 683 MBH (200 kW))

Installation and any service, maintenance or reparation of this product may only be done by a licensed heating technician, trained in and experienced with hot water boiler installation and gas combustion. The product must be installed according to all national and local codes having jurisdiction. Canadian installation must conform to CSA B149 & US installation ANSI Z223.1.

If you have any questions, need more information or require an engineer to call on site, please contact our technical help line 1.800.943.6275 Monday thru Friday 08:00 - 17:00 EST.

When contacting De Dietrich America's with a problem on the boiler, please provide the following information: the boiler type, Serial No (located on the bottom of the casing), and the symptoms or fault code (the fault code is a series of flashing digits in the display panel).

The data published in this manual is based on the latest information (at date of publication) and may be subject to revisions.

We reserve the right to continuous development in both design and manufacture, therefore any changes to the materials or technology employed may not be retrospective nor may we be obliged to adjust earlier supplies accordingly.

1 Introduction

1.1 Pictograms used

The following pictograms are used in this document to emphasize certain instructions. This is in order to increase your personal safety and to safeguard the technical reliability of the boiler. The pictograms used are:

Useful advice.

Important instruction for carrying out an action.

Possible risk of personal injury or material damage to boiler, building or environment.

Possible risk of electrical shocks. Serious personal injury may occur.

1.2 Important instructions

The boiler must be installed in a frost-free area.

Work on the boiler
Installation, commissioning, maintenance and repair work may only be carried out by suitably qualified specialist installers in accordance with the applicable national and local standards and guidelines. Always disconnect the mains supply and close the main gas cock when working on the boiler. Check the entire system for leaks after maintenance and servicing work.

Casing panels may only be removed for maintenance and servicing purposes. Refit all panels on completion of maintenance and servicing work.

Instructions and warning labels on the boiler must never be removed or covered and must be clearly legible throughout the entire service life of the boiler. Replace damaged or illegible instruction and warning labels immediately. Generally applicable safety instructions related to accident prevention must be consulted in addition to the information supplied in this manual.

Boiler modifications and spare parts
The boiler must not be modified or non OEM spare parts fitted without the written approval of De Dietrich Boilers.

Keep this document near the boiler.

2 Safety

Adhere strictly to the specific safety instructions.

Can you smell gas? Proceed as follows:

- Do not smoke and avoid fire and sparks.
- Do not operate electrical switches.
- Close the gas cock.
- Open doors and windows.
- Warn those present and leave the building together.
- Do not use any phone in the building.
- Call your gas supplier once your outside the building. If you cannot reach them, call the fire department.

Can you smell flue or combustion gases? Proceed as follows:

- Isolate the mains power supply from the boiler.
- Open doors and windows.
- Trace possible leaks and seal them off.

Do not use the boiler, if any part has been under water
Immediately call your service company to inspect the boiler and replace any part of the control or gas controls.

The boiler casing is not designed for supporting other items, damage to the casing will result if used for supporting or suspending items. Do not walk or use the boiler casing as a ladder.

3 Boiler description

3.1 General description

The De Dietrich C230 ECO-A is a pre-assembled, free standing, gas fired, high efficiency condensing boiler. The sectional cast aluminium heat exchanger and other major components are contained within a sealed air box. This forms the main boiler casing with a removable inspection hatch for maintenance purposes. All electrical and electronic controls are contained within the instrument panel mounted on top of the boiler.

The flue gas outlet, combustion air inlet, flow, return and gas connections are located on top of the boiler with a condensate connection at low level on the right hand side.

The boiler is suitable for room sealed or open flue applications and has been designed for central heating and indirect hot water production at working pressures not exceeding 100 psi (7 bar). It must be installed on a fully pumped system and is suitable for use on sealed installations.

The premix gas burner with its gas/air ration control system ensures clean, trouble free operation with higher than average efficiencies 109% (NCV) in the condensing mode combined with ultra low NO_x and minimum CO emissions. The standard control package allows actual and set values to be read and adjusted on the built-in digital display which also provides normal operating and fault code indication.

An intelligent, advanced boiler control (Comfort Master) continuously monitors the boiler conditions, varying the heat output to suit the system load. The control is able to react to external “negative” influences in the rest of the system (flow rates, gas/air supply problems) maintaining boiler output for as long as possible without resorting to a lockout condition. At worst the boiler will reduce its output and/or shutdown (shut off mode) awaiting the “negative" conditions to return to normal before restarting.

The Comfort Master control cannot override the standard flame safety controls.

3.2 Boiler layout

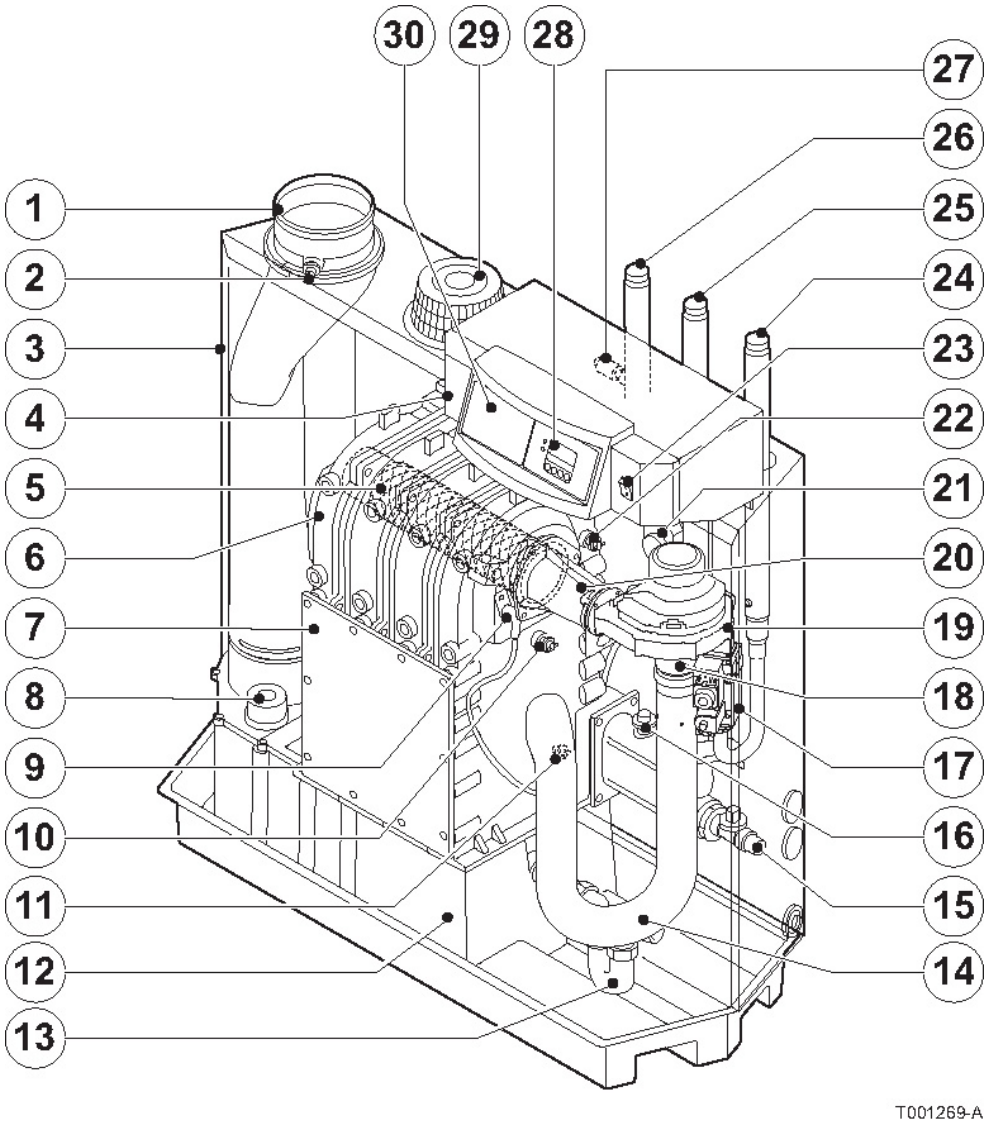


Fig. 1 Cross-section

1. Flue gas discharge
2. O_2/CO_2 measuring point
3. Air box
4. Control panel
5. Burner
6. Heat exchanger
7. Inspection hatch
8. Inspection hatch for condensate collector
9.Ignition pin
10. Boiler heath exchanger sensor
11. Return temperature sensor
12. Condensate collector
13. Condensate trap
14. Air silencing tube
15. Filling and drain cock
16. Water pressure switch (option)
17. Gas multiblock
18. Venturi
19. Fan
20.Mixing tube
21. Flue gas switch
22. Flow temperature sensor
23. On/off
24. Gas connection
25. Return connection
26. Flow connection
27. Thermostat pocket
28. Display
29. Combustion air supply
30. Facility for built-in weather compensator

3.3 Operating principle

Combustion air is drawn into the closed air box through the air inlet from the plant room (open flued) or from outside via the eccentric flue system (room sealed) by the boiler gas/air supply fan.

Depending on demand (under the dictates of flow/return sensor and other external/internal control inputs), the Comfort Master system determines the boiler output, which directly controls the volume of mixed gas and air to the premix burner. This mixture is initially ignited by the combined ignitions & ionization probe, which monitors the state of the flame. Should the flame be unstable or not ignite within the pre-set safety time cycle, the controls will shut the boiler down requiring manual intervention to reset the boiler. The digital display will indicate a flashing fault code confirming the reason for the failure.

The products of combustion in the form of hot flue gases are forced through the heat exchanger transferring their heat to the system water (the flue gas temperature is reduced to approximately 9°F (5 °C) above the temperature of the system return water). Then they are discharged via the condensate collector, vertically through the 5.9” (150 mm) flue gas connection to the atmosphere.

Because of the low flue gas exit temperature there will be a vapor cloud formed at the flue gas terminal - this is not smoke, simply water vapor formed during the combustion process.

If the controls allow the flow and therefore return temperature to fall below dew point (131 °F (55 °C)) this water vapor will begin to condense out in the boiler, transferring its latent heat into the system water, increasing the output of the boiler without increasing the gas consumption. Condensation formed within the boiler and flue system is discharged from the boiler to an external drain via the drain pan/siphon supplied.

3.4 Boiler Control

3.4.1 Temperature control

The C230 ECO-A is equipped with electronic temperature control based on flow, return and boiler block temperature sensors. The flow temperature is adjustable between 68 and 194°F (20 and 90°C) (factory setting 176°F (80°C)).

3.4.2 Low water level protection

The C230 ECO-A is equipped with low water protection based on temperature difference measurements and temperature increase measurements. In some jurisdictions this internal function may not be acceptable, a separate low water cut-off (LWCO) safety device will be needed.

This function safeguards the boiler only, a separate control is needed for the system.

3.4.3 Maximum protection

The maximum protection switches the unit off if the water temperature is too high (230°F (110°C)) and interlocks it on the control box. Once the fault has been remedied, the unit can be reset using the **reset-** key.

3.4.4 Frost protection

The unit must be installed in a frost-free area to prevent freezing of the condensate drain pipe. If the temperature of the heating water drops too much, the built-in unit protection activates.

4 Installation

4.1 Standards and certifications

- Installation, commissioning, maintenance and repair work must only be carried out by a suitably qualified specialist.
- Installations must conform to national and local codes having jurisdiction. Canadian installation must conform to CSA B149 & US installation ANSI Z223.1.
- The Gas 230 ECO-A boiler or any of its components do not contain crystalline silica.
- The boiler is certified to use natural gas only with a gas supply of < 0.5 psig or a gas supply pressure range of 7-14" w.c. [17-35 mbar] max.
- The Gas 230 ECO-A boilers are certified with the burner control unit Comfort Master. Consult local codes having jurisdiction for other requirements.
- All installation must provide a fitted safety relief valve on the boiler supply piping, without any obstructions or valves. The safety relief valve needs to be piped to a nearby drain that will avoid personal injury or damage to property. The relief valve must be sized according to the minimum relief capacity as listed on the boiler nameplate. Consult local or national code having jurisdictions regarding the relief valve piping arrangement.
- The condensate is very aggressive and can be harmful to some drain systems, neutralization of the condensate may be necessary, consult local codes.
- The boiler requires an adequate supply of combustion air, unless the boiler is a sealed combustion system. The boiler needs a clean combustion air source according to CSA B149 & ANSI Z223 gas codes.

4.2 Regulations governing installation

Installation and maintenance must be done by a qualified professional, in compliance with prevailing local and national regulations.

– Gas Installation Code CSA B 149 & ANSI Z223.1 (NFPA 54)

In addition to the above regulations, this boiler must be installed in compliance with:
– National & local building codes
– ASME CSD-1 as required
– CSA & NEC electrical codes
– Other Regulations

The C230 ECO-A is a CSA certified boiler and must not be modified or installed in any way contrary to this Installation manual.
Manufacturer's Instructions must NOT be taken as overriding statutory obligations.

4.3 Scope of delivery and installation

The boiler is supplied fully assembled and protected. The boiler is placed on a pallet (28" (70 cm) x 51" (130 cm) x 57" (145 cm)), which can be transported with a pallet truck, hand truck, forklift truck or 4-wheel transport boards. The packaging passes through all standard doors (minimum width of 29" (74.5 cm)).

The boiler is installed as follows:

- Position the pallet with the boiler in the boiler room;
- Remove the fixing bands and all other packaging (some components are packaged in the polystyrene cap);
- Lift the boiler from the pallet;
- Slide the boiler into the required position, using the recessed handles in the boiler base;
- Cover the boiler and do not operate it while dust creating construction processes or insulation to the pipe work etc. are carried out in the plant room.
- Install the boiler such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during operation and service.

Do not install the boiler on carpet or other combustible materials.

Do not install the boiler near combustible constructions, vent connector, and steam and hot-water pipes.

Dimensions

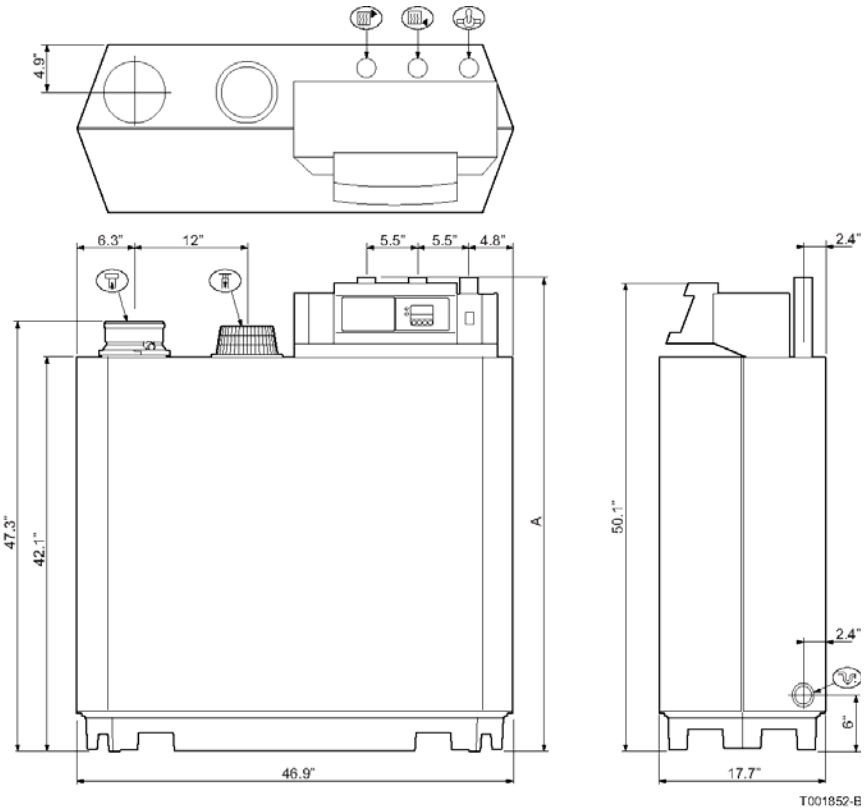
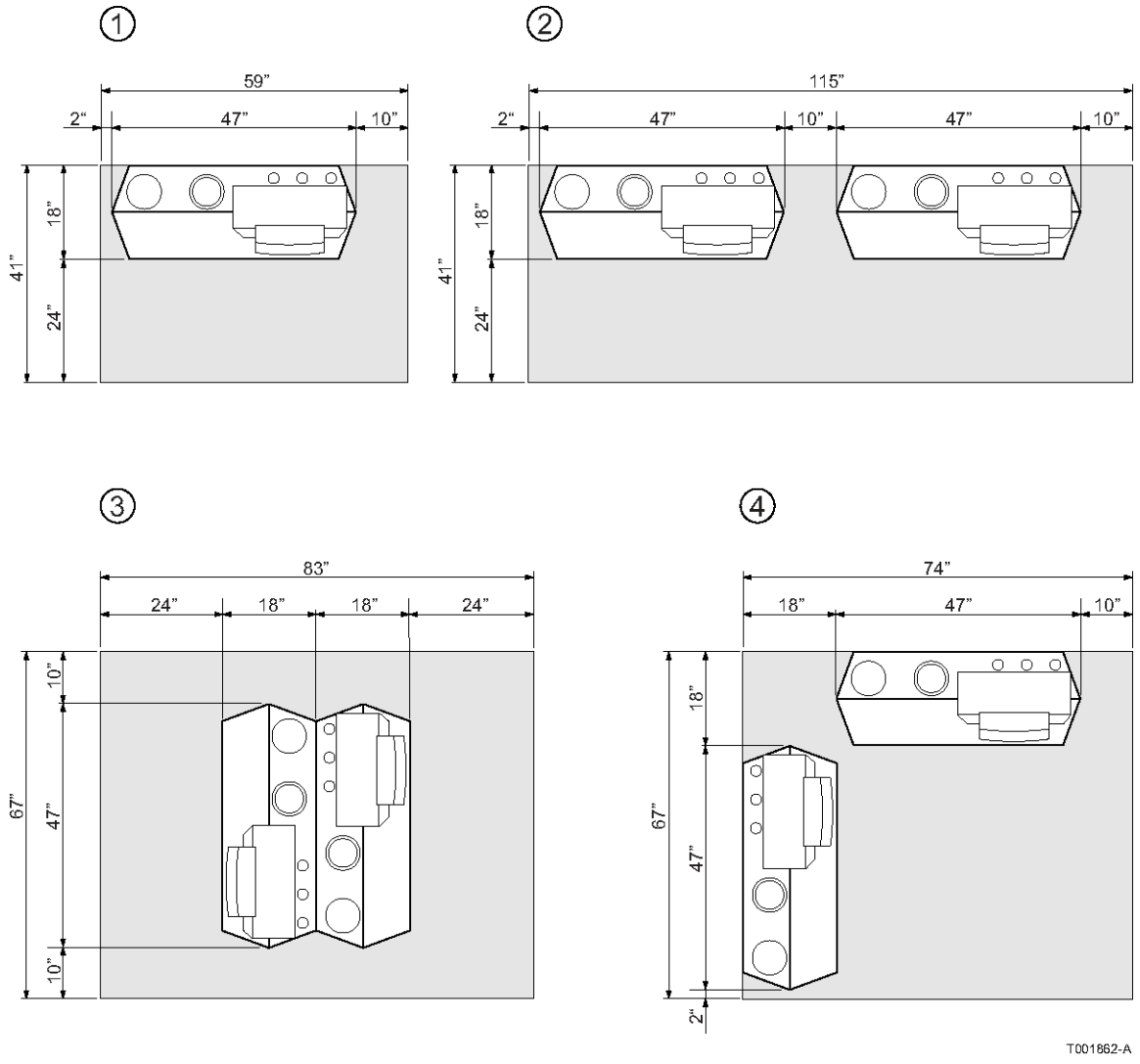


Fig. 2 Elevation drawings

Connection	C230 ECO-A 80/120/160/200
Flow	2” NPT thread (do not remove the adapter, pipe is non-NPT)
Return	2” NPT thread (do not remove the adapter, pipe is non-NPT)
Gas connection	2” NPT thread (do not remove the adapter, pipe is non-NPT)
Condensate drain	∅ 1.26" (32 mm) external
Combustion air supply	∅ 5.91" (150 mm)
Flue gas outlet	∅ 5.91" (150 mm)
Dimension “**A**”	52½” (1330 mm)

4.4 Installation and service clearances

Clearance of at least 24" (600 mm) is required at the front of the boiler. However, we recommend a clearance of 40" (1 m). We recommend a clearance of at least 16" (400 mm) above the boiler control panel, at least 2" (50 mm) on the left side and at least 10" (25 cm) on the right side in connection with condensed water discharge. Install a gas cock in the immediate vicinity of/above the boiler.



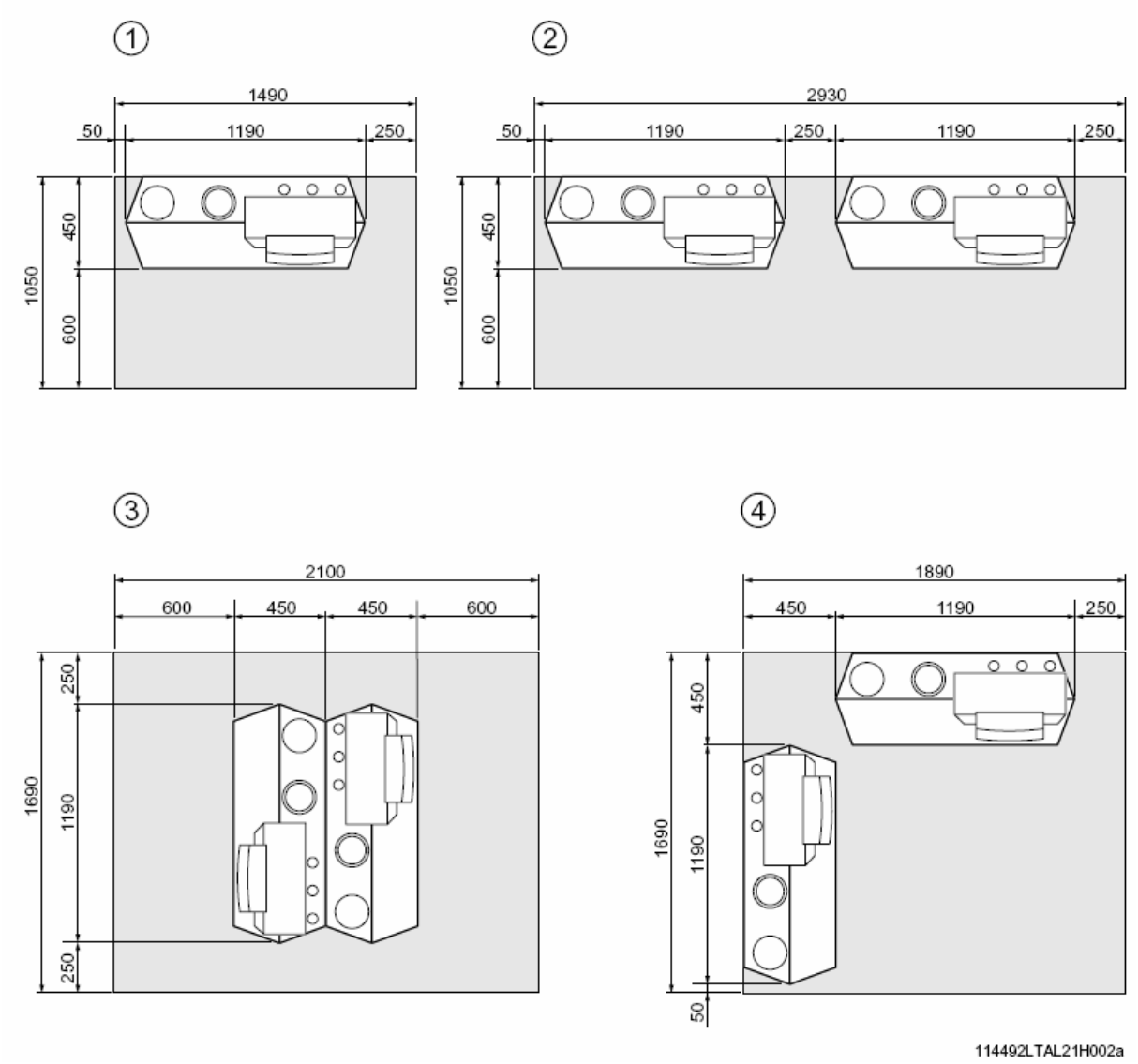


Fig. 3 Boiler room installation options (in inches and mm)

5 W ater-side connections

5.1.1 Flue gas condensation discharge

Discharge the condensate water directly into a city water drain. In view of the acidity level of the condensate (pH between 3 and 5), use only materials that can resist flue gas condensation for the discharge pipe. The use of neutralizer shall be considered for older drains or where local codes require.

After assembly, fill the trap with clean water. Make an open connection with the drain. The discharge pipe must slope down by at least 3"/100" (30 mm/m). Condensed water must not be discharged into gutters or rain water down pipes.

5.1.2 Water treatment

- Use untreated tap water only to fill the heating system.
- The pH value of the system water must be between 7 and 9.
- If water treatment is used, the chemicals used shall comply with the water quality requirements and must not affect cast aluminium boilers. Follow the manufacturer's instructions given.

For further information a special document about water quality regulations is available from De Dietrich America's. The regulations mentioned in this document must be followed.

As most systems contain a variety of metals, it is considered good practice to provide some form of water treatment in order to prevent or reduce the following:

- Metallic corrosion
- Formation of scale and sludge
- Microbiological contamination
- Chemical changes in the untreated system water

All scale or calcium deposits, will reduce the efficiency of the boiler and should be prevented.

Suitable chemicals and their use should be discussed with a specialist water treatment company prior to carrying out any work (environmental aspects, health aspects). The specification of the system and manufacturers recommendations must be taken into account, along with the age and condition of the system. New systems should be flushed thoroughly to remove all traces of flux, debris, grease and metal swarf generated during installation. Take care with old systems to ensure any black metallic iron oxide sludge and other corrosive residues are removed, again by power flushing, ensuring that the system is drained completely from all low points.

Please ensure that the new boiler plant is not in circuit when the flushing takes place, especially if cleansing chemicals are used to assist the process.

It is important to check the inhibitor concentration after installation, system modifications, filling the system and every service in accordance with these instructions.

For the correct dosage and the suitability of inhibitors for use with our boilers and for further information on water treatment or system cleaning we advise you to contact a water treatment company who is experienced with our boilers.

5.1.3 Circulation pump

The boiler is equipped with a pump switch to connect an external circulation pump. This pump is run once every 24 hours to prevent sticking (24 hour pump operation).

Only on/off pumps can be controlled. For connections, see Section 8.4.6.

The hydraulic resistance for the various output options of the boiler is as follows:

Boiler model	Hydraulic resistance at a ΔT of 36°F (20°C)		Hydraulic resistance at a ΔT of 18°F (10°C)	
	mbar	psi	mbar	psi
C230 80	165	2.39	545	7.90
C230 120	135	1.96	446	6.47
C230 160	170	2,47	562	8.15
C230 200	180	2,61	595	8.63

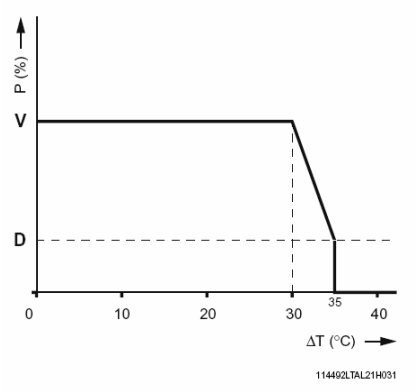


Fig. 4 Output control characteristic

V = full load
D = part load
P = heat output
ΔT = temperature difference

5.1.4 Water flow

The maximum temperature difference between flow and return, and the maximum rate of rise of the flow temperature and boiler block temperature are limited by the boiler's modulating controls. As a result, the boiler is virtually unaffected by low water flow. However for a continuous supply of heat, the boiler requires a minimum flow of 30% of the nominal flow at the relevant design temperatures.

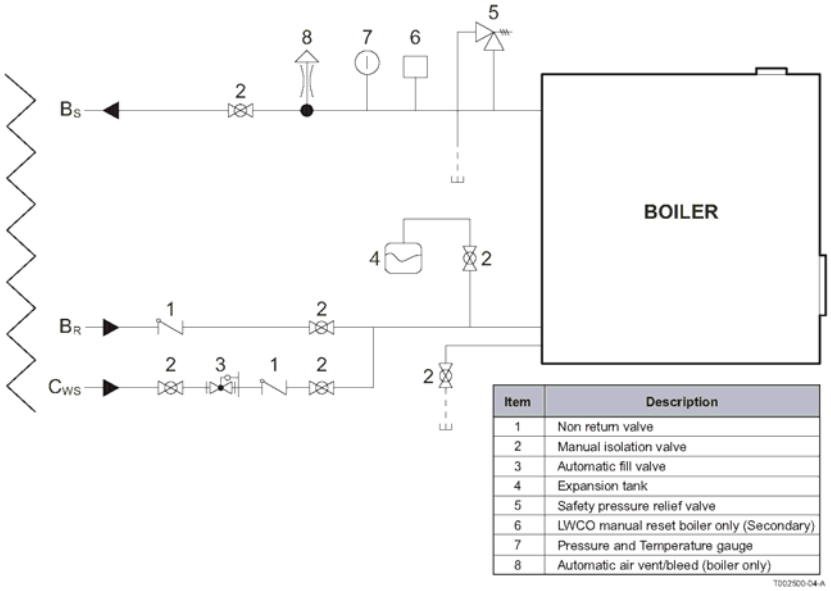
5.1.5 Water pressure

The boiler is suitable for a maximum working pressure of 100 psi (6.8 bar) according to ASME MWAP = 100 psi. The minimum operating pressure shall not be less than < 11.6 psi (0.8 bar).

5.1.6 Safety relief valve

A safety relief valve NB certified with V or HV & CRN symbols, must be installed within 20 inches on the boiler supply piping without any obstructions. The relief valve must not be smaller than 3/4 inch and not larger than 4 inch. The pressure shall not exceed 10% above the MAWP and must be of an automatic reset type. The valve opening must be routed away so that no injury or damage to property will result. Consult local codes. When replacing the valve, the relief capacity must be more than the minimum relief capacity shown on the boiler rating plate.

5.1.7 Water system layout



Item	Description
1	Non return valve
2	Manual isolation valve
3	Automatic fill valve
4	Expansion tank
5	Safety pressure relief valve
6	LWCO manual reset boiler only (Secondary)
7	Pressure and Temperature gauge
8	Automatic air vent/bleed (boiler only)

Fig. 5 Boiler water connections (minimum)

The above piping diagram illustrates the minimum boiler system controls needed, the by-pass system is not necessary, but can be used in multiple heating temperature circuits.

The boiler if installed above radiation (heating circuits below the boiler) or as required by local codes or authorities having jurisdiction must install a low water cut-off safety device, The LWCO is not a standard scope of supply, but is available as an option. The boiler has been approved and has found to be in compliance to the LWCO protection, provided the factory pre-set high limit and flow temperatures are not altered and the modulating controls are used and no minimum flow is required as the Comfort master system will monitor these conditions and reduce the boiler output, finally shutting down until the flow conditions improve, As a result, the boiler is virtually unaffected by low water flow. Although boiler flow and content protection is provided, does not safeguard the entire heating system, additional low water content and temperature safety control maybe needed in certain jurisdictions.

It is strongly recommended that a decoupling device is installed to isolate the boiler during non working times and/or when the system or boiler flow is unknown

When the boiler is connected to a refrigeration system, it must be installed so the chilled medium is piped in parallel with the boiler with appropriate valves to prevent the chilled medium from entering the boiler.

The boiler piping system of a hot water boiler connected to heating coils located in air handling units where they may be exposed to refrigeration air circulation must be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during cooling operations.

6 Gas-side connections

6.1 Gas connection

The boiler is suitable for use with natural gas and propane*. For other types of natural gas, consult our Technical department. All gas appliances must, by law, be installed by competent persons. Failure to install appliances correctly could lead to prosecution.

It is in your own interest and that of safety to ensure that the law is complied with.

The gas connection is at the top of the boiler. We recommend installing a gas filter in the gas supply pipe to avoid pollution of the gas multiblock. The gas filter's resistance must not be so high that the minimum inlet gas pressure can no longer be achieved.

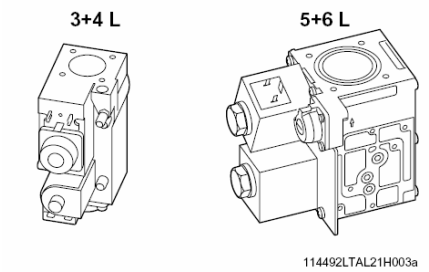
Gas installation instructions

1. A main gas shutoff valve should be connected to the boiler within accessible area and within hand reach.
2. A sediment trap must be installed upstream of the main gas shutoff valve.
3. The boiler gas train (valve) does not require venting or bleeding, a VPS can be used in jurisdiction where required.

The boiler and the individual shutoff valve must be leak tested according to local and national gas installation codes B149 & ANSI Z223.1. If the leak pressure testing exceeds 1/2 psi (35 mbar) the boiler and the individual gas shutoff valve shall be isolated and disconnect during this test.

* OEM gas conversion kit required (optional).

6.2 Gas pressure



The boiler has been factory set and tested to natural gas (G20) - with an inlet pressure of 7 inches w.c.(17 mbar).

Higher gas supply pressure(s) require a separate service regulator.

Natural gas supply inlet pressure range 3.5 - 14 inches w.c. (< 0.5 psi) [8.7 - 35 mbar) is required.

For propane (LPG), an inlet pressure of 8 - 13 inches w.c. (< 0.5 psi) [20 - 32 mbar) is required.

Fig. 6 Gas multiblocks

Gas system pressure checks

- The boiler main gas cock shutoff valve and piping must be isolated from any gas piping pressure testing in excess of 0.5 psi (35 mbar).
- The boiler main gas cock shutoff valve and piping must be isolated by closing the main gas cock shutoff valve during gas piping pressure testing less than 0.5 psi (35 mbar).
- The boiler main gas piping and gas train must be leak tested prior to placing the boiler in operation.

6.3 Gas/air ratio control

The boiler has a zero governor gas valve. This gas valve maintains the ratio between the gas and air quantities in the burner at a constant level under variable loads. This ensures clean and reliable combustion and high efficiency across the entire load range. There is no need to vent the gas valve.

7 Flue gas discharge and air supply

7.1 General

The C230 ECO-A is suitable for both conventional room-supplied or sealed combustion. Sealed combustion terminals should comply with the local and national codes. Any horizontal pipe-work in the flue gas discharge system should slope towards the boiler. Horizontal pipe-work in the air supply system should slope towards the supply opening and may require a drain point at the low point. Care should be taken when locating flue exit positions as a vapor plume will be visible when the boiler is operational (flue gas temperature will be less than 170°F [77°C] resulting in the water vapor condensing out on contact with the air).

Provisions for combustion and ventilation air in accordance with section 5.3, Air for Combustion and Ventilation, of the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or Sections 7.2, 7.3 or 7.4 of the Natural Gas and Propane Installation Code, CAN/CSA B149.1, or applicable provisions of the local building codes.

For boilers for connection to gas vents or chimneys, vent installation shall be in accordance with Part 7, Venting of Equipment, of the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or Section 7, Venting Systems and Air Supply for Appliances, of the Natural Gas and Propane Installation Code, CAN/CSA B149.1, or applicable provisions of the local building codes.

The venting system shall be installed in accordance with the boiler manufacturer's installation instructions.

The horizontal portions of the venting system shall be supported to prevent sagging. Follow the instructions of the supplier of the venting system.

7.1.1 Boiler Venting Types

Flue gas venting
Use only an approved gas vent category II and IV type "BH" (AL29-4C stainless steel vent material). Plastic vent material (CPVC/PVC) can be used where local/national codes allow.

Conventional Chimney Applications
A vertical chimney-vent system with the air supply, required for combustion, provided within the boiler room or combustion air source provided into the room.

CLV – Direct Vent (Sealed Combustion) Systems Applications
Vertical or horizontal venting systems for both, the flue gases and combustion air operating at two different pressure zones or vent terminal locations.

Sidewall Vented & Direct Vent [Sealed Combustion] Applications
A horizontal vent system with the air supply, required for combustion, provided within the boiler room or combustion air sources provided into the room.

7.1.2 Venting options

The standard delivery of the C230 ECO-A boiler can be installed with any of the venting options listed above. See each respective section for details; discard the air intake grill when using sealed combustion vent systems.

7.1.3 Vent Termination Inlet/Outlets

The vent terminals must be installed to provide suitable protection against wind, rain, snow or blockage along with a rodent/debris screen. See section 7.1.5, 7.1.6 and 7.1.7 for other requirements. Conventional chimney application tapered cone (finishing cone), and sidewall or direct vent require a termination TEE or 90º elbow fitting.

7.1.4 Combustion Air Supply Requirements

The boiler requires a clean, fresh and adequate supply of combustion air, failure to provide sufficient combustion air supply will result in carbon monoxide (CO) production that could lead to personal injury including loss of life or damage to boiler or property. Do not store any flammable liquids, fluids, vapors or materials near the vicinity of the boiler.

Special attention
- Quality of combustion air
- Dust, fumes, corrosive elements, hydrocarbons, other unknown containments
- Paint, beauty, automotive etc. shops

The flue gas vent pipe must be airtight and watertight. Horizontal sections of the venting must slope downward towards the boiler ½" per linear foot [42 mm/m] and adequate vent support must be provided.

Room combustion air supply requirements
The boiler must be provided with an adequate combustion air supply, the combustion air supply requirements must be determined and sized in accordance to national and local codes having jurisdiction. CSA B149 & ANSI Z223.1 – More than one combustion air source may be required. An optional air intake filter should be fitted air intake housing (recommendation).

Air supply venting materials
Aluminium, stainless steel or PVC/CPVC (UL 181 or ULc S-110 class 1).

Air supply structure
The air supply pipe must also be airtight. Horizontal sections in the air supply must slope away from the boiler towards the supply opening and incorporate a drain connection if the route rises from a lower point. It is necessary to provide an easily removable air vent for maintenance reasons.

7.1.5 Conventional Chimney Venting & CLV system Application Requirements

The boiler should never be operated in a negative building pressure. Caution should be exercised with exhaust fans, air handling & other devices, that could affect the buildings air pressure or combustion air supply. All venting must be arranged to avoid and prevent the accumulation of flue gas condensation. Where necessary, have means provided for drainage of condensate.

An improperly sealed venting system could result in carbon monoxide poisoning; ensure adequate support and fastening of the system. Ensure venting can safely exhaust all flue gases to the outside in a safe and effective manner. Do not puncture or drill holes in any portion of the venting, the boiler is equipped with a pressure and emission test port.

Precautions for Co-venting
Only co-vent this boiler with another, category II or IV, appliance. When co-venting the C230 ECO-A boiler a vent damper is required. Co-venting with other appliances shall conform and be sized in accordance to local and national codes [CSA B149 & ANSI Z223.1] according to appropriate tables in Part II of the above mentioned codes.

Venting lengths must not exceed the minimum and maximum equivalent lengths shown in the following two tables. Any horizontal runs of the venting must slope towards the boiler ½” per linear foot.

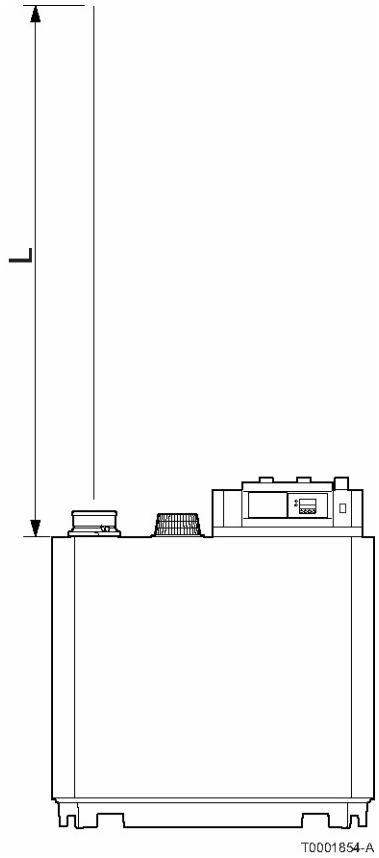


Fig. 7 Conventional chimney vented single boiler with room supplied combustion air

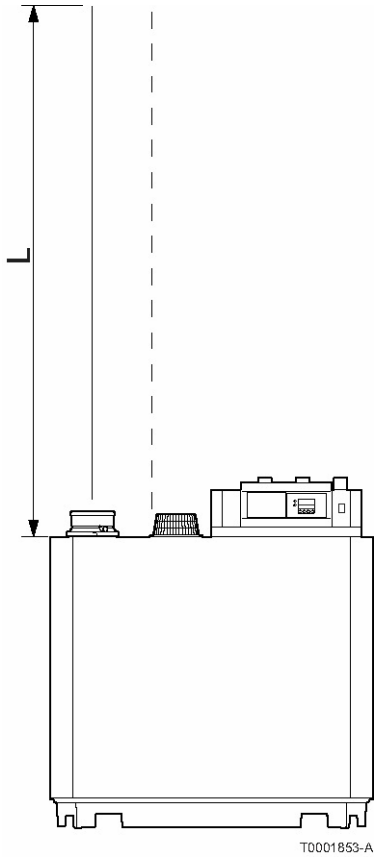


Fig. 8 Conventional chimney vented single boiler with sealed combustion air

Model	Vent diameter (min) inch [mm]	Vent length (min) ft [m]	Vent length (max) ft [m]
C230 ECO-A 80	4 [100]	5 [1.5]	60 [18]
	5 [125]		165 [50]
	6 [150]		245[75]
C230 ECO-A 120	4 [100]	5 [1.5]	25 [8]
	5 [125]		165 [50]
	6 [150]		165 [50]
	7 [180]		245 [75]
C230 ECO-A 160	5 [125]	5 [1.5]	65 [20]
	6 [150]		145 [45]
	7 [180]		245 [75]
C230 ECO-A 200	5 [125]	5 [1.5]	45 [14]
	6 [150]		100 [30]
	7 [180]		165 [50]
	8 [200]		245 [75]

Table 1 Conventional chimney applications*

Model	Vent diameter (min) inch [mm]	Vent length (min) ft [m]	Vent length (max) ft [m]
C230 ECO-A 80	4 [100]	5 [1.5]	25 [8]
	5 [125]		100 [30]
	6 [150]		165 [50]
C230 ECO-A 120	4 [100]	5 [1.5]	25 [8]
	5 [125]		65 [20]
	6 [150]		165 [50]
	7 [180]		245 [75]
C230 ECO-A 160	5 [125]	5 [1.5]	65 [20]
	6 [150]		145 [45]
	7 [180]		245 [75]
C230 ECO-A 200	5 [125]	5 [1.5]	45 [14]
	6 [150]		100 [30]
	7 [180]		165 [50]
	8 [200]		245 [75]

Table 2 Conventional chimney with direct vent & CLV system applications*

*Vent length tables application note:
All lengths shown in chart are for both flue gas and combustion air intake vent, based on equivalent lengths.

45° Elbow = 4 ft. [1.2m] of equivalent length
90° Elbow = 8 ft. [2.1m] of equivalent length
180° Offsets = 16 ft. [4.2m] of equivalent length

The vent terminals shall be included with vent lengths.
Vent risers required for below grade installation shall not be part of the vent length unless the riser exceeds 10 ft. [3m].

Chimney applications
This venting system uses a single vent to discharge all flue gases to the outside vertically, combustion air provided with the boiler room, the air source must be sized in accordance to national codes CSA B149 & ANSI Z223.1 or local codes having jurisdiction, more than one source may be required.

Different Pressure Zones [CLV]
This venting system uses two separate vents, a vent for combustion air and another for the flue gases. Combustion air is not used within the boiler room. All combustion air is from the outdoor source. The vent terminal shall discharge flue gases away from the building structure so that the flue gases do not cause damage to the building. The vent terminal locations follow local and national codes requirements. See section 7.1.8.

Application Note
In all applications the venting must be between the minimum and maximum equivalent vent lengths shown in Table 1 or Table 2. For values not shown in the chart, consult your local De Dietrich Representative.

Exterior Venting
The venting shall be suitable for exterior applications, the flue exit point shall be provided with a tapered [finishing] cone, with a debris/bird-rodent screen, combustion air inlet shall be provide with a termination 90° elbow with a debris/bird-rodent screen.

Flue gas condensation is very aggressive and corrosive which could lead to failure of the venting system or drains, consult local and national codes regarding flue gas condensation disposal. The P-trap assembly must be properly filled with water to avoid escape of the flue gas emissions. The flue gas condensation may require neutralization prior to entering the drain.

7.1.6 Direct Vent-Sealed Combustion Application

An improperly sealed venting system could result in carbon monoxide poisoning; ensure adequate support and fastening of the system. Ensure venting can safely exhaust all flue gases to the outside in a safe and effective manner. Do not puncture or drill holes in any portion of the venting, the boiler is equipped with a pressure and emission test port. All venting must be arranged to avoid and prevent the accumulation of flue gas condensation. Where necessary, have means provided for drainage of condensate.

Do not co-vent the C230 ECO -A boiler when venting the boiler either direct vent [sidewall] or in sealed combustion venting application. Venting lengths must not exceed the minimum and maximum equivalent lengths shown in Table 3. Any horizontal runs of the venting must slope towards the boiler ½" per linear foot (42 mm/m).

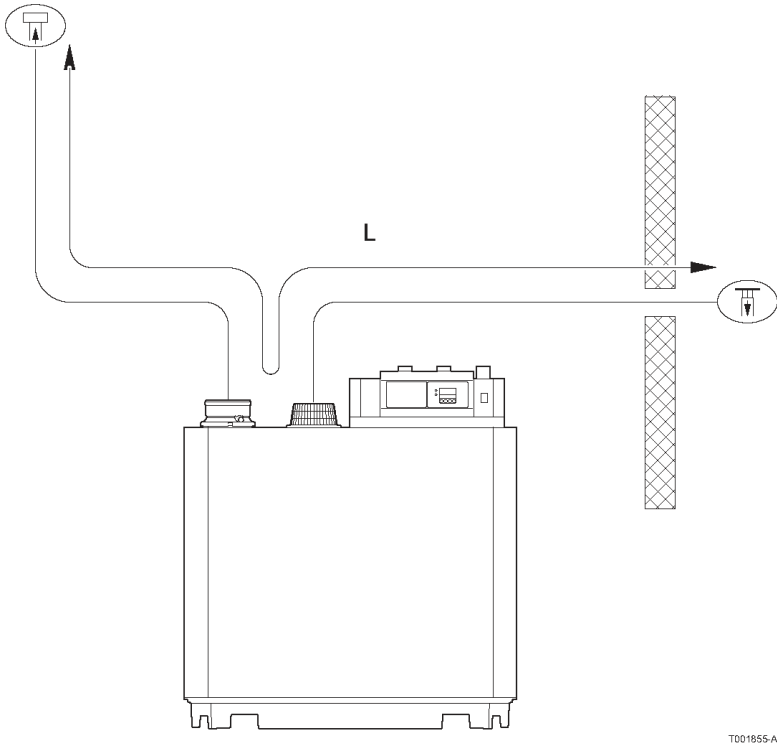


Fig. 9 Sidewall & direct vent (sealed combustion) systems

Model	Vent diameter (min) inch [mm]	Vent length (min) ft [m]	Vent length (max) ft [m]
C230 ECO -A 80	4 [100]	5 [1.5]	15 [5]
	5 [125]	5 [1.5]	25 [8]
	6 [150]	5 [1.5]	65 [20]
	7 [180]	5 [1.5]	100 [30]
C230 ECO -A 120	4 [100]	5 [1.5]	10 [3]
	5 [125]	5 [1.5]	35 [11]
	6 [150]	5 [1.5]	65 [20]
	7 [180]	5 [1.5]	100 [30]
C230 ECO -A 160	5 [125]	5 [1.5]	35 [11]
	6 [150]	5 [1.5]	70 [21]
	7 [180]	5 [1.5]	100 [30]
C230 ECO -A 200	5 [125]	5 [1.5]	14 [4]
	6 [150]	5 [1.5]	40 [12]
	7 [180]	5 [1.5]	65 [20]
	8 [200]	5 [1.5]	100 [30]

Table 3 Sidewall vented & direct vent applications *

*Vent length tables application note:
All lengths shown in chart are for both flue gas and combustion air intake vent, based on equivalent lengths:

45° Elbow = 4 ft. [1.2m] of equivalent length
90° Elbow = 8 ft. [2.1m] of equivalent length
180° Offsets = 16 ft. [4.2m] of equivalent length

The vent terminals shall be included with vent lengths.
Vent risers required for below grade installation shall not be part of the vent length unless the riser exceeds 10 ft. [3m].

Sidewall & direct vent (sealed combustion) systems
This venting system uses two separate vent system of either a coaxial or a single vent for combustion air and the flue gases. Combustion air is not needed for boiler. All combustion air is from the outdoor source. The vent terminal shall discharge flue gases away from the building structure so that the flue gases do not cause damage to the building (see section 7.1.8).

Sidewall vented applications
This venting system uses a single vent to discharge all flue gases to the outside, combustion air provided within the boiler room, the air source must be sized in accordance to national codes CSA B149 & ANSI Z223.1 or local codes having jurisdiction, more than one source may be required. The vent terminal locations follow local and national codes requirements. The vent terminal shall discharge flue gases away from the building structure so that the flue gases do not cause damage to the building, the vent terminal locations must also follow CSA B149 & ANSI Z223 (see section 7.1.8).

Application Note
The venting must be between the minimum and maximum equivalent vent lengths show in Table 3. For values not shown, consult your local De Dietrich Representative.

Flue gas condensation is very aggressive and corrosive which could lead to failure of the venting system or drains, consult local and national codes regarding flue gas condensation disposal. The P-trap assembly must be properly filled with water to avoid escape of flue gas emissions. The flue gas condensation may require neutralization prior to entering the drain.

7.1.7 Co-venting – Retrofitting

At the time of removal of any existing boiler from a common vent system, the following steps shall be performed with each remaining appliance connected to the common vent in operation and not in operation. This boiler must not be co-vented with a category I or III appliance. The boiler must have a vent damper installed when co-venting with other appliances.

1. Any used opening of the vent system be properly sealed
2. Visually inspect the venting system for proper size and horizontal pitch. Determine there is no blockage, restriction, leakage, corrosion and other deficiencies that could cause an unsafe condition.
3. Close all building doors, windows and all doors between the appliances which remain connected to the common venting system and other space of the building. Turn on clothes dryers, exhaust fan at maximum speed and any appliance not connected to the common vent system, close fireplace dampers. Do not operate a summer exhaust fan.
4. Place in operation each of the appliances installed in the common vent system being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
5. Test for spillage near and around each of the gas appliances after 5 minutes of main burner operation.
6. After determining that each appliance remains connected to the common venting system properly vents when tested as outlined above, return all doors, windows, exhaust fan, fireplace dampers and any other gas burning appliance to their normal positions.
7. Any improper operating of the venting system must be corrected so the installation conforms to both ANSI Z223.1/NFPA 54 or CAN/CSA B149.1 gas installation codes. When resizing any portion of the common venting system, the common venting system shall be resized to approach the minimum size as determined using the appropriate tables in Part II of ANSI Z223.1/NFPA 54 gas code &/or CAN/CSA B149.1 natural gas and propane installation code.

7.1.8 Vent terminations installation precautions

[Consult national & local codes for other requirements]

All exhaust terminations for conventional chimney must be finished with a finishing cone with tapered end, with a bird/rodent screen. All direct vent and sealed combustion systems must be finished with TEE termination type, the combustion air inlet must be a 90° and must be provided with a debris/bird-rodent screen. All terminals shall be arranged to avoid and prevent the accumulation of flue gas condensation.

In all installations avoid vent termination locations where excessive debris or snow could accumulate leading to blocking of the vent terminals or where prevailing winds and rain could enter the vent terminal creating additional resistance to the venting system.

Vent terminals should avoid being installed where the building exterior could be tarnished from the flue gases, a shield or another location should be considered.

The vent terminals shall be installed according to the instructions as provided. Terminals shall not be less than 2 inches [50 mm] from the wall surface or more than 10 inches [254 mm] from the center line of the terminal to the wall. For high traffic locations, the vent terminal shall be guarded.

According to the national gas codes [CSA B149 & ANSI Z223.1/NFPA 54] a vent shall not terminate...

- Directly above a paved walkway or driveway which serves two or more buildings or where the flue gas condensation or vapor could create a hazard or improper operation of regulators, relief's or valves or any other device.
- Above or below any electric or gas meter, regulators & relief devices unless a 4 ft [1.2 m] horizontal clearance distance to be maintained.
- Less than 7 ft [2.1 m] above any paved sidewalk or driveway.
- Less than 6f t [1.8 m] from any combustion air inlet source from any nearby building.
- Less than 4 ft [1.2 m] above a meter/regulator assembly horizontally from a vertical centerline of the regulator vent outlet to a maximum vertical distance of 15 ft [4.6 m].
- Less than 1 ft [0.3 m] above grade or normal snow level in the area is expected.
- Less than 3 ft [0.9 m] from windows, doorways, and combustion air supplies nearby buildings or other appliances.
- Under a veranda, porch or deck, unless [1] the veranda, porch or deck is fully open on at least 2 sides underneath. [2] The distance between the top of the terminal and the grade is greater than 1 ft [0.3 m]

8 Control and electrical connections

8.1 General

The boiler is equipped with electronic control and safety equipment with ionization flame protection.

The advanced boiler control Comfort Master, is a microprocessor that protects and controls the boiler. The boiler is fully prewired; all external connections are made on the terminal strips (24V and 120V). Connect the boiler to the mains supply in accordance with the local electricity supplier's instructions and NEC/NFPA 70 & CEC CSA 22.1 Electrical codes.

Each boiler must be fused protected for a single phase power source 120/160 @ 15A. The circuit must be earth grounded (bonded) and provided with a service switch that is within the general vicinity of the boiler and within hand reach (clearly marked and identified).

Electrical shock hazard, can cause personal injury or loss of life, including property damage.

All electrical wiring to the boiler and controls must be protected from ingest of water and be properly grounded and bonded according to CEC Part I CSA 22.1 & NEC NFPA 70.

8.1.1 Boiler control

The heat output of the C230 ECO-A can be controlled as follows:

- **Modulating**, where the output modulates between the minimum and maximum values on the basis of the flow temperature defined by the modulating controller.
- **On/off control**, where the heat output modulates between the minimum and maximum values on the basis of the flow temperature set in the unit. This can be combined with an outside sensor so that the internal heating curve is used.
- **Analogue control** (0-10 V), where the heat output or temperature is controlled by a 0-10 V signal, see Section 8.5. Only possible with optional 0 - 10 V control PCB (IF-01).
- **Analogue control** (0-20 mA), where the heat output or temperature is controlled by a 0-20 mA signal, see Section 8.6. Only possible with optional 0 - 20 mA control PCB.

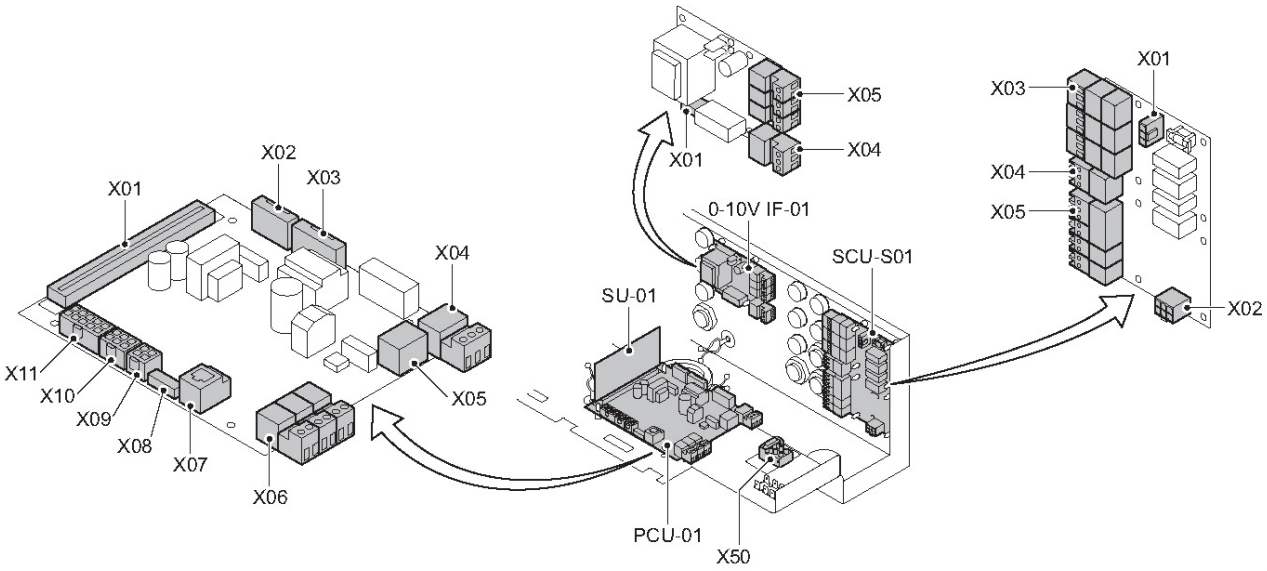
8.1.2 Modulating controls general

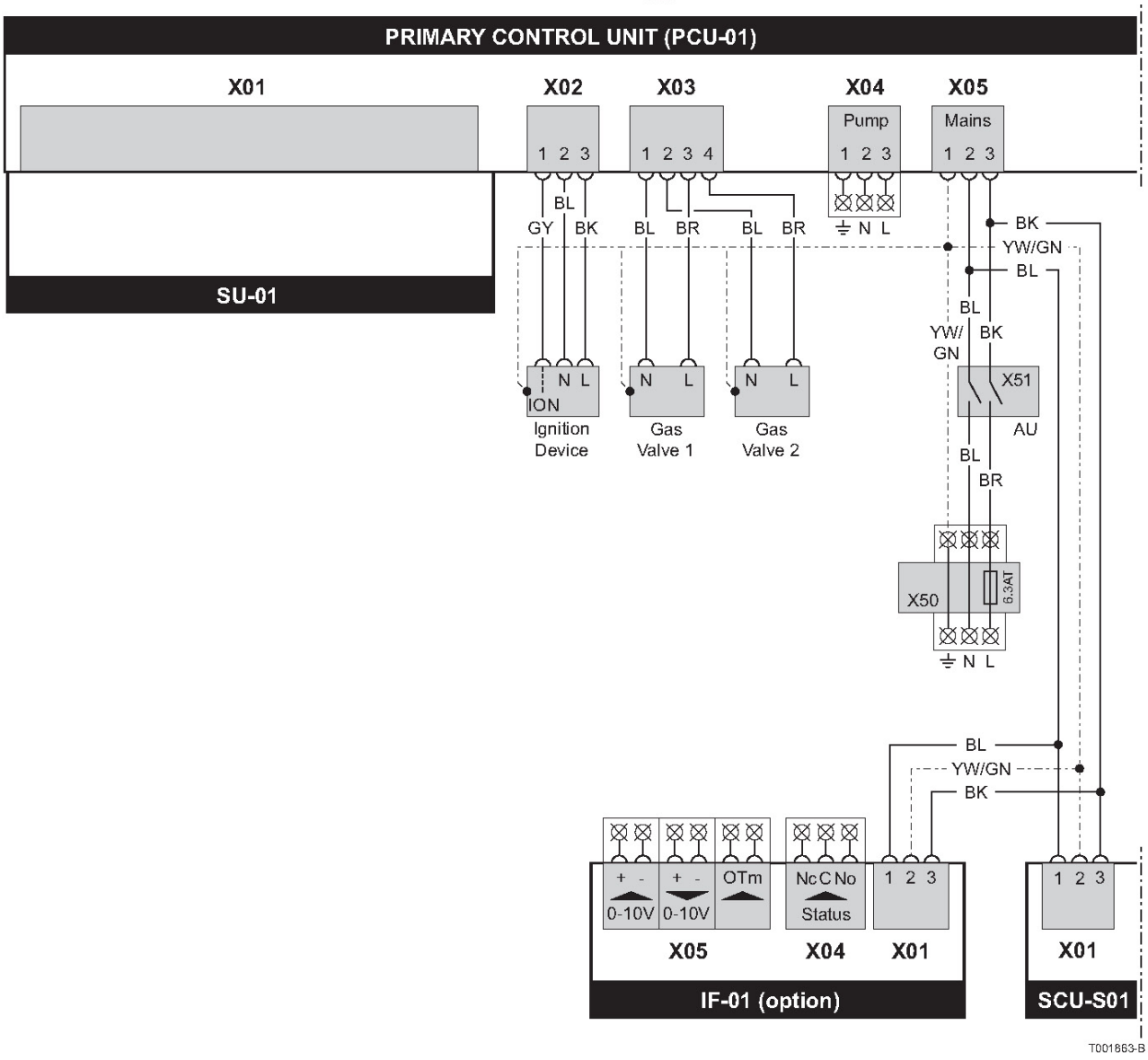
The modulating nature of the boiler is used to maximum effect with a modulating controller. If the controller demands heat, the boiler supplies the heat output. If the controller demands a flow temperature, the boiler modulates to this value. This increases the number of operating hours and drastically reduces the number of starts. Combined with the fixed gas/air mixture, this results in greater efficiency. The C230 Eco-A can be connected to a modulating room control, see section 8.1.3.

8.1.3 Modulating room control

The boiler is set up for communication via the OpenTherm protocol. Modulating controllers can be connected according to the OpenTherm protocol. The controller is mounted in a reference area. Connection is made with a two-core cable to the **On/off - OT** terminals of terminal strip ***X6*** (not polarity sensitive).

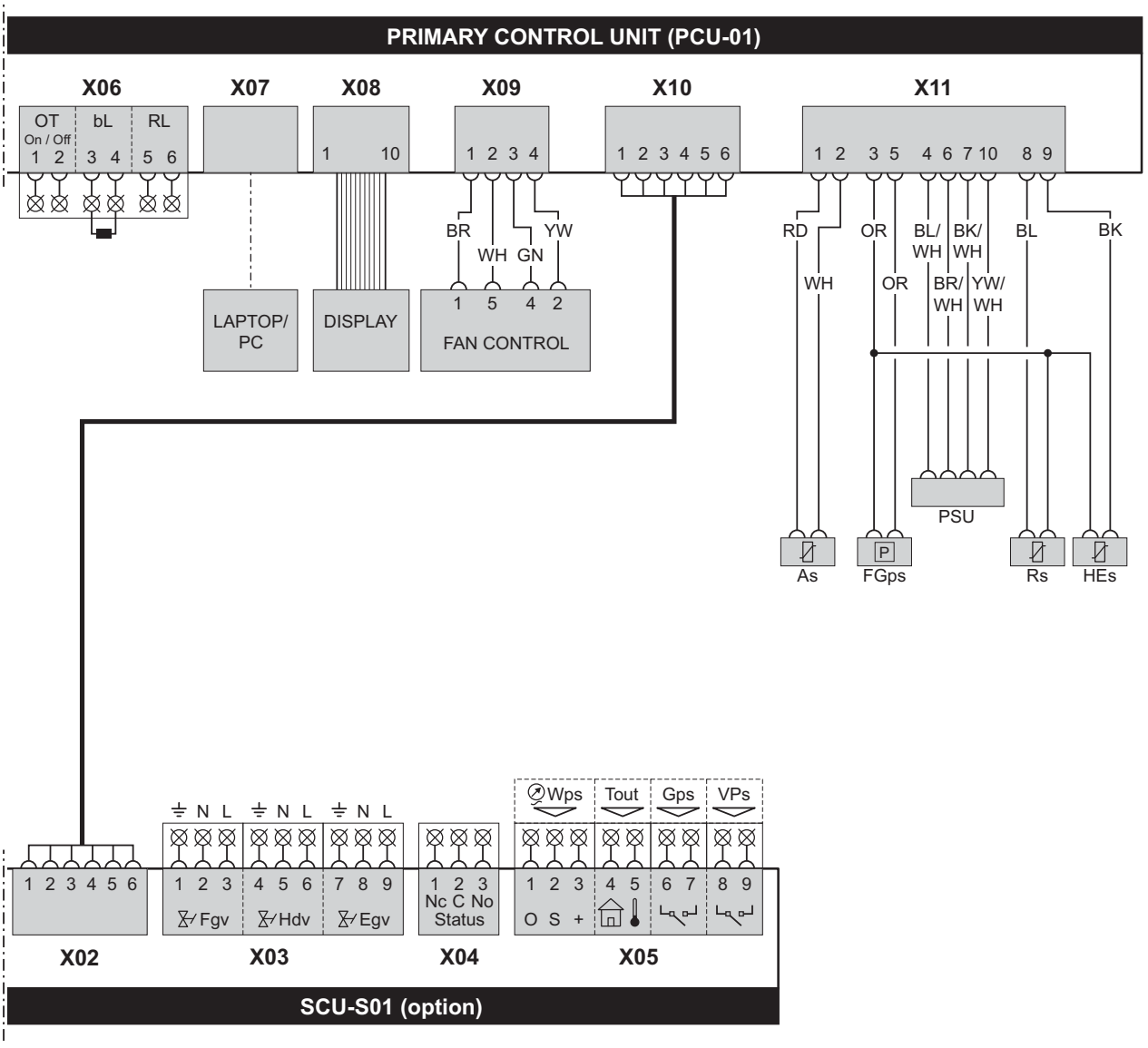
8.2 Wiring diagrams





WIRE COLORS	
BK	BLACK
BL	BLUE
BR	BROWN
GN	GREEN
GY	GRAY
OR	ORANGE
RD	RED
WH	WHITE
YW	YELLOW
YW/GN	YELLOW/GREEN

COMPONENTS	
As	Flow sensor
AU	On/off switch
bL	Blocking input
FGps	Flue gas pressure switch
Ft	Flow temperature
Gps	Gas pressure switch
HEs	Heat exchange sensor
RL	Release input
OTm / OT	Open Therm
Tout	Outside Temperature sensor
Ps	Pressure sensor
Rs	Return sensor
VPs	Valve leak proof system pressure switch
WPs	Water pressure sensor



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8.3 Electrical specifications

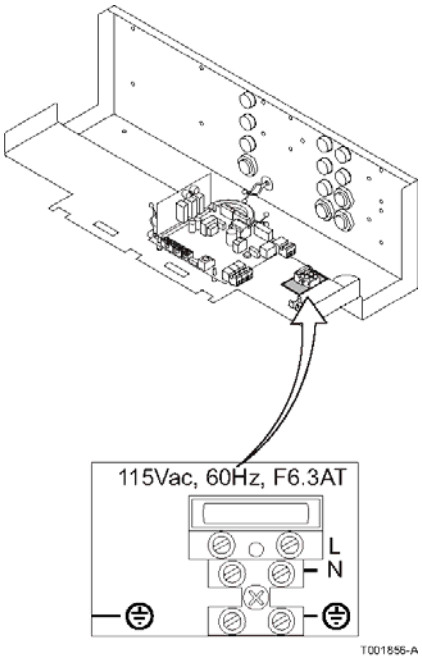


Fig. 10 Connect mains lead

8.3.1 Mains voltage

The boiler is suitable for a 120 V-60 Hz supply with live/neutral/earth (the control is phase/neutral sensitive). Other connection values are only acceptable if an isolating transformer is installed. Connect the mains lead (not supplied) to the 120 V terminal strip.

8.3.2 Control box

Mains voltage : 115 V/60 Hz
Power consumption at: stand-by/low load/full load:

- C230 ECO-A 80 : 4 / 36 / 125 W
- C230 ECO-A 120 : 4 / 37 / 193 W
- C230 ECO-A 160 : 4 / 53 / 206 W
- C230 ECO-A 200 : 4 / 54 / 317 W

Safety time : 3.5 s
Anti-hunting time : Adaptive 1 - 10 minutes.
Pump post-circulation time : adjustable between 0 and 98 minutes or continuous (= 99 minutes), set by default to 3 minutes
Max. power consumption of external pump: 300 VA.

8.3.3 Fuse ratings

The 120 V terminal strip contains the fuse F - 6.3 AT.
This is a general fuse for all connected components.
The control unit contains the fuse F1 - 3.2 AT.
This is a fuse for the mains voltage of the control unit, gas multiblock and ignition, excluding pump.

8.4 Electrical connection options

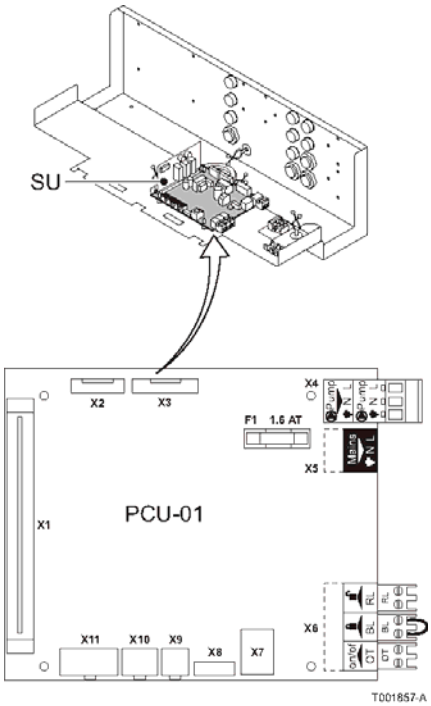


Fig. 11 Standard control PCB (PCU-01) with safety unit (SU)

The boiler has several control, protection and regulation connection options. The standard control PCB (PCU-01) can for example be expanded with:

- an optional 0 - 10 V control PCB (available as an accessory IF-01);
- and/or the optional expanded control/protection PCB (available as an accessory SCU-S01).

To install or access these PCBs, the plastic cap must be removed from the control panel. The required external connections are made on these (optional) PCBs. The various connection options are detailed in the following sections.

8.4.1 Connection options of standard control unit (PCU-01)

Connected on the standard control unit (PCU-01) is the safety unit (SU) connected, which protects the boiler.

8.4.2 On/off control (OT)

The boiler is suitable for connection to a 'volt free' on/off controller. Connect the controller to the **On/off - OT** terminals of terminal strip X6 (not polarity sensitive).

8.4.3 Modulating controls (OT)

The boiler is set up for communication via the OpenTherm protocol. Modulating controllers can be connected.
Connection is made with a two-core cable to the **On/off - OT** terminals of terminal strip ***X6*** (it does not matter which wire is connected to which cable clamp).

8.4.4 External interlock (BL)

The boiler has an external interlock switch, so that the boiler can be shutdown in the event that this switch is not made. This input can be used in combination with a flue gas thermostat (available as an accessory). This input relates to the **BL** terminals of terminal strip ***X6***. Remove the wire bridge before using the input. For example, low water controls and auxiliary safety limit(s).

The input's behaviour depends on the parameter 33 setting:
1 = Normal shutdown;
2 = Shutdown without frost-protection (= default);
3 = Lock out.

8.4.5 Input release (RL)

The boiler is also equipped with an input release so that the burner can be released/shutdown. This input can be used in combination with the limit switches on flue gas throttle valves, hydraulic control valves, safety interlocks, etc. This input relates to the **RL** terminals of terminal strip ***X6***.

8.4.6 Circulation pump (Pump)

A pump with the following specifications can be connected:

- On/off pump with a mains voltage of 120 VAC (60 Hz) and 300 VA (maximum).

Connect the pump to the **Pump** terminals of terminal strip ***X4***. The post-circulation time of the circulation pump at the end of a heat demand can be set according to requirements by means of a program option at user level, see Section 8.1.6.

8.5 Connection options for the optional 0 - 10 V control PCB (IF-01)

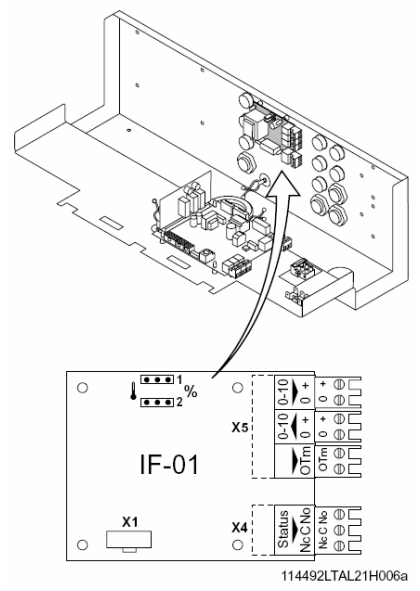


Fig. 12 Jumper 2

8.5.1 Connection status (Nc)

If the boiler locks out, a relay is de-energized and the alarm can be transmitted via a potential-free contact (maximum 120 V, 1 A) on terminals **Nc** and **C** of terminal strip ***X4***.

8.5.2 OTm connection

The interface uses OpenTherm to communicate with the boiler control. The **OTm** connection on terminal strip ***X5*** must therefore be connected to the OpenTherm OT input of the boiler control.

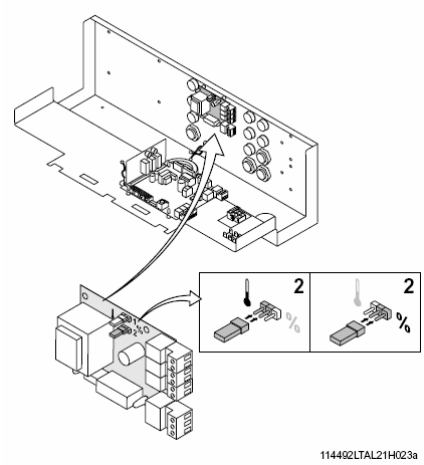


Fig. 13 Jumper 2

8.5.3 Analogue input (0 - 10 V)

This control can be based on temperature or heat output (optional). The two controls are described briefly below. Connect the 0 - 10 V signal to the interface input for analogue control.

Analogue temperature-based control ( )
The 0-10 V signal controls the boiler flow temperature between 32°F (0°C) and 212°F (100°C). This control modulates on the basis of flow temperature, where the heat output varies between the minimum and maximum values on the basis of the set point flow temperature calculated by the controller.

Jumper (**2**) on the interface is used to select either temperature ( ) or boiler output (**%**) control.

Jumper 2	Input signal [V]	Temperature [°F]	Description
	0 - 1,5	32 – 59	Boiler off
	1,5 – 1,8	59 - 64	Hysteresis
	1,8 - 10	64 -212	Desired temperature

Table 4 Analog input signal for temperature

Analogue output-based control (%)
The 0-10 V signal controls the boiler output between 0% and 100%, where the minimum and maximum values are limited. The minimum output is linked to the boiler's modulation depth. This control is output modulated, where the output varies between the minimum and maximum values on the basis of the value defined by the controller.

Jumper 2	Input signal [V]	Boiler output [%]	Description
%	0 - 2,0*	0 – 20	Boiler off
	2,0 - 2,2*	20 – 22	Hysteresis
	2,0* - 10	20 -100	Desired boiler output
* Dependent on the minimum modulation dept (fan rotation speeds settings, pre set 20%)			

Table 5 Analogue input signal for boiler output

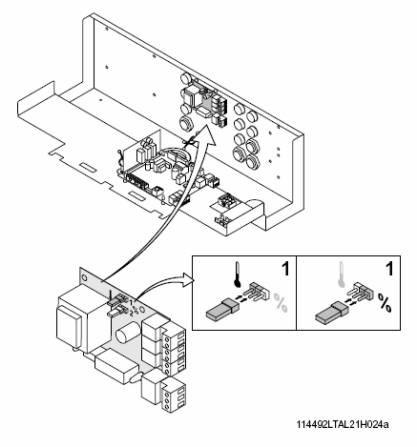


Fig. 14 Jumper 1

8.5.4 Analogue input (0 - 10 V)

If this feedback message is received, temperature or heat output can be selected. The two are described briefly below.

Jumper (**1**) on the interface is used to select either temperature (🌡) or boiler output (**%**).

Jumper 1	Output signal [V]	Temperature [°F]	Description
🌡	0,5	-	Alarm
	1- 10	50 – 212	Delivered temperature

Table 6 Analogue output signal for temperature

Jumper 1	Output signal [V]	Boiler output [%]	Description
%	0	0 - 15	Boiler off
	0,5	15 - 18	Alarm
	2,0* - 10	20 - 100	Delivered boiler output
* Dependent on the minimum modulation dept (fan rotation speeds settings, pre set 20%)			

Table 7 Analogue output signal for boiler output

8.6 Connection options for the optional 0 - 20 mA control PCB

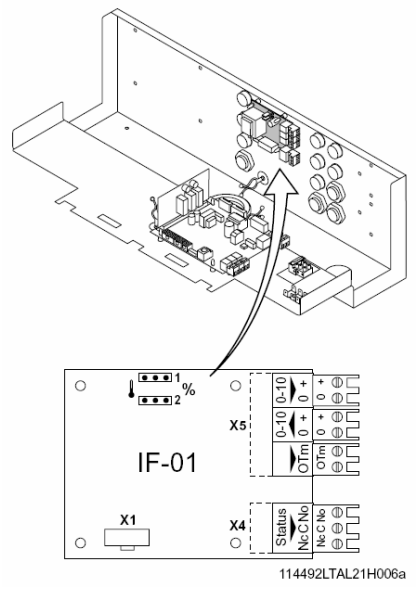


Fig. 15 Jumper 2

8.6.1 Connection status (Nc)

If the boiler locks out, a relay is de-energized and the alarm can be transmitted via a potential-free contact (maximum 120 V, 1 A) on terminals **Nc** and **C** of terminal strip ***X4***.

8.6.2 OTm connection

The interface uses OpenTherm to communicate with the boiler control. The **OTm** connection on terminal strip ***X5*** must therefore be connected to the OpenTherm OT input of the boiler control.

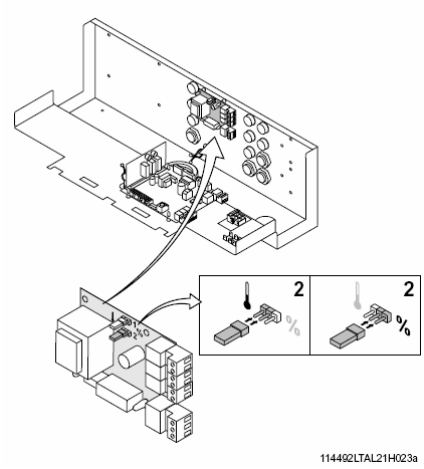


Fig. 16 Jumper 2

8.6.3 Analogue input (0 - 20 mA)

This control can be based on temperature or heat output (optional). The two controls are described briefly below. Connect the 0 - 20 mA signal to the interface input for analogue control.

Analogue temperature-based control ( )
The 0-12 mA signal controls the boiler flow temperature between 32°F (0°C) and 212°F (100°C). This control modulates on the basis of flow temperature, where the heat output varies between the minimum and maximum values on the basis of the set point flow temperature calculated by the controller.

Jumper (**2**) on the interface is used to select either temperature ( ) or boiler output (**%**) control.

Install a resistor (500 Ω) over 0 and + to modify 0 - 20 mA to 0 - 10 V.

Jumper 2	Input signal [mA]	Temperature [°F]	Description
	0 - 3	32 – 59	Boiler off
	3 – 4.2	59 - 64	Hysteresis
	4 - 20	64 -212	Desired temperature

Table 8 Analog input signal for temperature

Analogue output-based control (%)
The 0-20 mA signal controls the boiler output between 0% and 100%, where the minimum and maximum values are limited. The minimum output is linked to the boiler's modulation depth. This control is output

modulated, where the output varies between the minimum and maximum values on the basis of the value defined by the controller.

Jumper 2	Input signal [mA]	Boiler output [%]	Description
%	0 - 3.6*	0 – 20	Boiler off
	4 - 4.4*	20 – 22	Hysteresis
	4* - 20	20 -100	Desired boiler output
* Dependent on the minimum modulation dept (fan rotation speeds settings, pre set 20%)			

Table 9 Analogue input signal for boiler output

8.6.4 Analogue input (0 - 20 mA)

If this feedback message is received, temperature or heat output can be selected. The two are described briefly below.

Jumper (**1**) on the interface is used to select either temperature (🌡) or boiler output (**%**).

Feedback is given in V.

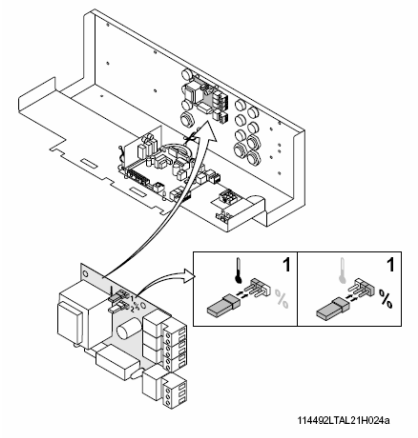


Fig. 17 Jumper 1

Jumper 1	Output signal [V]	Temperature [°F]	Description
🌡	0.5	-	Alarm
	1 - 10	50 – 212	Delivered temperature

Table 10 Analogue output signal for temperature

Jumper 1	Output signal [mA]	Boiler output [%]	Description
%	0	0 - 15	Boiler off
	0.5	15 - 18	Alarm
	2.0* - 10	20 - 100	Delivered boiler output
* Dependent on the minimum modulation dept (fan rotation speeds settings, pre set 20%)			

Table 11 Analogue output signal for boiler output

8.7 Connection options of the optional expanded control/protection PCB (SCU-S01)

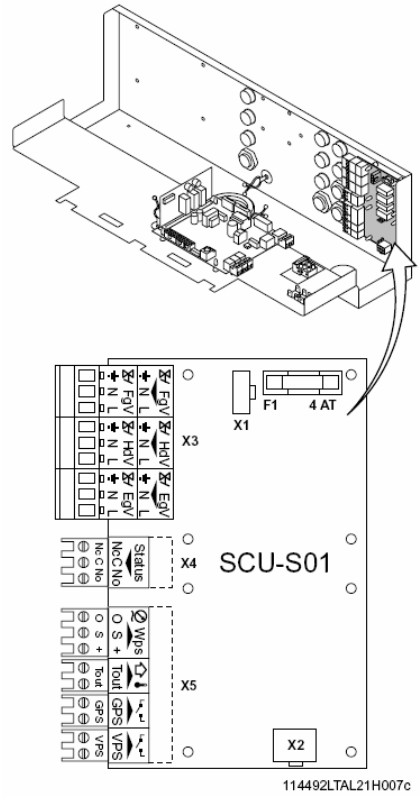


Fig. 18 Expanded control/protection PCB (SCU-S01).

8.7.1 Flue gas damper control (FgV)

In a cascade configuration, a flue gas damper prevents flue gases from being discharged through a non-operating boiler, with flue gas cascade. Therefore, the boiler is suitable for flue gas overpressure systems. Consult our Technical department. Connect the flue gas damper to the **FgV** terminals of terminal strip ***X3***. Also fit this flue gas damper if flue gases flow back when the boiler is in stand-by mode.

The running time of the flue gas damper must be programmed with parameter 29.

8.7.2 Hydraulic valve control (HdV)

In a cascade configuration, a hydraulic valve prevents heat loss when the boiler is not running. Connect the hydraulic valve to the **HdV** terminals of terminal strip ***X3***. The running time of the hydraulic valve must be programmed with parameter 28.

8.7.3 External gas valve control (EgV)

If there is a heat demand, an alternating voltage of 120 V 1 A (maximum) becomes available on the **EgV** terminals of terminal strip ***X3*** to control an external gas valve. The voltage is switched off when the gas multiblock on the boiler closes.

8.7.4 Operation signal and failure signal (Nc / No)

The alarm or operation signal is selected using the relevant parameter 25, see Section 8.1.6. If the boiler is operational, the alarm or operation signal can be switched via a potential-free contact (maximum of 120 V, 1 A) on the **No** and **C** terminals of terminal strip ***X4***. If the boiler locks out, the alarm can be transmitted via a potential-free contact (maximum 120 V, 1 A) on terminals **No** and **C** of terminal strip ***X4***.

8.7.5 Water pressure sensor (Wps)

The water pressure sensor shuts the boiler down when the minimum water pressure (11.6 psi, 0.8 bar) is reached. To activate the water pressure sensor, a minimum pressure must be set with parameter 26 (factory setting 0 = off, see Section 9.1.6) The pump does not run during this shutdown.
Connect the water pressure sensor to the **Wps** terminals of terminal strip ***X5***.
0 = Earth or neutral of the power supply
S = Signal or output from the sensor
+ = Supply voltage

8.7.6 Outside temperature sensor (Tout)

To take advantage of the boiler's modulating operation during the entire heating season, an outside temperature sensor (available as an accessory) can be used in combination with an on/off control or connection. Connect the on/off control or connection to the **On/off** terminals of terminal strip ***X6*** on the standard control PCB (PCU-01) and the outside temperature sensor to the **Tout** terminals of terminal strip ***X5*** on the optional expanded control/protection PCB (SCU-S01). The unit modulates with a heat demand from the controller or because of a connection to a flow temperature corresponding to the outside temperature (see heating curve graph).

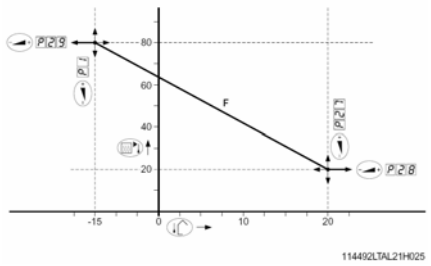


Fig. 19 Heating curve graph
F = factory setting

Fitting the outside temperature sensor

Fit the external sensor, protected against direct sunlight, to the north or north-west side of the building, at a height of at least 8 feet (2.5 metres) from ground level. Do not fit the outside temperature sensor near windows, doors, ventilation grills and extractors, etc.

Heating curve setting

The maximum flow temperature setting is also the setting for the 'top' of the heating curve, i.e. the required flow temperature for an outside temperature of 5°F (-15°C). The baseline of the heating curve is also adjustable and can be changed at service level, see Section 9.1.6. A linear relationship exists between the outside temperatures mentioned and the corresponding flow temperatures.

8.7.7 Minimum gas pressure switch (Gps)

The minimum gas pressure (available as an accessory) switch shuts the boiler down if the inlet gas pressure becomes too low. Connect the minimum gas pressure switch to the **Gps** terminals of terminal strip ***X5***. The presence of the gas pressure switch must be activated using parameter 27 in the setting mode.

8.7.8 Gas leakage control (VPS; only for 230- 160 and 230- 200 boilers)

The gas leakage control checks and controls the safety valves on the gas block via a VPS system. The test takes place when the boiler starts. In the event of a leak in the gas block, the boiler will lock out. Connect the gas leakage control to the **VPS** terminals of terminal strip ***X5***. The presence of a gas leakage control must be entered using parameter 31.

9 Commissioning

9.1 Control panel

The boiler's control panel contains four function keys, a menu key, a service engineers key, an on/off switch and a display.

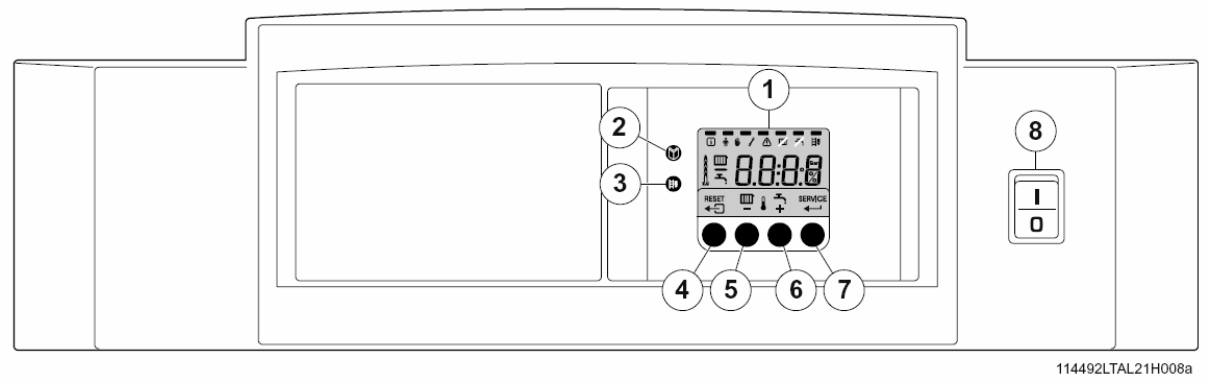


Fig. 20 Control panel

1 = Display
2 = [Menu] key
3 = [Service engineers] key
*4 = [Escape] or **[reset]** key*
*5 = [Central heating temperature] or **[-]** key*
*6 = **[+]** key*
*7 = **[enter]** key or [Service] indicator*
8 = On/off switch

The display has four positions and several symbols and provides information about the operating status of the boiler and any faults. Numbers, dots and/or letters may be shown. The symbols in the display above the function keys indicate what the function of the relevant keys is at that moment. If no key is pressed for three minutes, the display lighting switches off and only the and symbols are displayed. Press any key; the current boiler status and the current operating code appear on the display. This is always displayed in the event of a fault.

9.1.1 Normal start-up procedure

Switch on the mains supply to the boiler; the C230 ECO-A will perform the start-up program.
The following will appear in succession in the display:

- a short display test, whereby all of the display's segments are visible;
  F:XX software version alternating with 1.01E;
  P:XX parameter version;
- Afterwards (depending on the operating status), the following may appear on the display:
  N : L (flashes) : live and neutral wires are wrongly connected; change wires on the 120 V terminal strip!

With a heat demand :
1 Boiler starts
2 Burner starts
3 Central heating operation; briefly in part load then in full load
When a heat demand ceases:
5 Burner stops
6 Boiler stops
0 Stand-by mode

Table 12 Normal operation

9.1.2 Fault during start-up procedure

If nothing appears on the display, check:
- the connection of the mains lead;
- the main fuse in the instrument box (F = 6.3 AT, 120 V);
- the fuse on the control unit (F1 = 1.6 AT, 110 V);
- the mains voltage.

- A fault code in the display is recognised as follows: the fault symbol ⚠ appears and the fault code flashes underneath it;
- The meaning of this fault code can be found in the fault table, see Section 10.2.
- If possible, solve the fault first.
- Press the **reset** key for 3 seconds to restart the C230 Eco-A.

If the display does not show RESET but SERVICE, the boiler must be switched off and switched on again after 10 seconds before the fault can be reset.

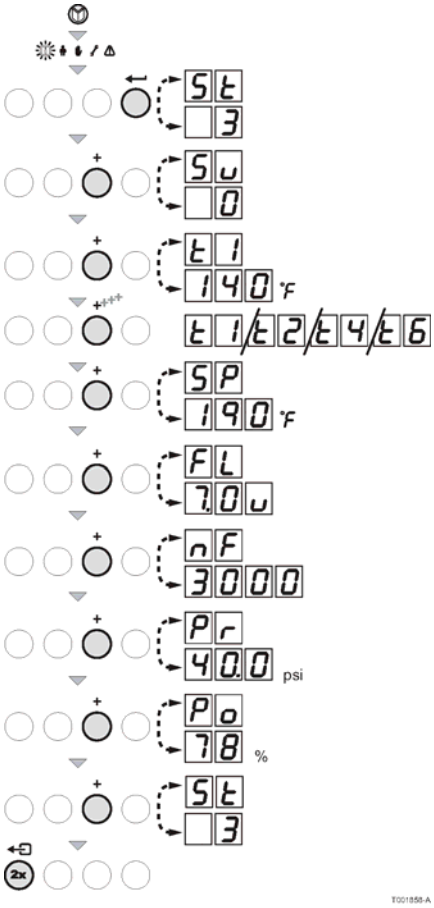


Fig. 21 Reading current values

9.1.3 Reading current values

The following current values can be read in the 'information menu' ⓘ

- St = Status
- Su = Sub status
- t1 = flow temperature [°F];
- t2 = return temperature [°F];
- t4 = outside temperature [°F] (only if outside sensor is connected);
- t6 = boiler block temperature [°F];
- SP = internal set point [°F];
- FL = ionization current [µA];
- nF = fan rotation speed [rpm];
- Pr = water pressure [inches w.c.];
- Po = relative output supplied [%];

The current values can be read as follows:

- Press the ⌂ key, the ⓘ symbol will then flash, confirm with the ↵ key;
- Press the **[+]** key again so that St appears alternating with 3, the actual status;
- Press the **[+]** key again so that Su appears alternating with 0, the actual sub status;
- Press the **[+]** key again so that t1 appears, alternating with, for example, 140°F (60°C), the actual flow temperature;
- Press the **[+]** key repeatedly so that the remaining temperatures also appear;
- Press the **[+]** key again so that SP appears, alternating with, for example, 190°F (88°C), an internal set point;
- Press the **[+]** key again so that FL appears alternating with, for example, 7.0µ, the actual ionization current;
- Press the **[+]** key again so that nF appears alternating with, for example, 3000 (rpm), the actual fan rotation speed;
- Press the **[+]** key again until Pr appears alternating and, for example, 40.0 psi (2.8 bar), the actual water pressure
- (if no water pressure sensor is connected, 11.11 psi appears);
- Press the **[+]** key again until Po appears and, for example, 78%, the actual modulation percentage;
- Press the **[+]** key again, the read-out cycle starts again with St, etc;
- Press the ↵ key twice to return to the display with the current operating status.

Status and sub status
In the 'information menu' ⓘ the following status and sub status numbers are displayed:

Status St		**Sub status** SU	
Number	**Status**	**Number**	**Sub status**
0	Stand-by mode	0	Stand-by mode
1	Boiler starts (heat demand)	1	Anti-hunting
		2	Open hydraulic valve
		3	Start pump
		4	Wait for the correct temperatures for burner start
2	Burner starts	10	Open external gas valve
		11	Fan running
		12	Open flue gas damper
		13	Pre-ventilation
		14	Wait for release signal
		15	Burner on
		16	VPS gas leakage control
		17	For ignition
		18	Main ignition
		19	Flame detection
		20	Intermediate ventilation
3	Burning on central heating operation	30	Temperature control
		31	Limited temperature control (ΔT safety)
		32	Output control
		33	Increase protection level 1 (control modulation)
		34	Increase protection level 2 (part load)
		35	Increase protection level 3 (shut down)
		36	Modulate up for flame control
		37	Stabilisation time
		38	Cold start
5	Burner stop	40	Burner off
		41	Post ventilation
		42	Fan running
		43	Close flue gas damper
		44	Stop fan
		45	Close the external gas valve
6	Boiler stop (end of heat demand)	60	Pump post circulation
		61	Pump off
		62	Close hydraulic valve
		63	Start anti-hunting
8	Control stop	0	Wait for burner start
		1	Anti-hunting
9	Shutdown	xx	Shutdown xx

Table 13 Settings at service level

9.1.4 Adjusting the boiler to the system

The boiler's control parameters are set to the most common central heating systems. With these settings, practically all central heating systems will work well. However, the user or the installer can optimize the parameters as he/she wishes.

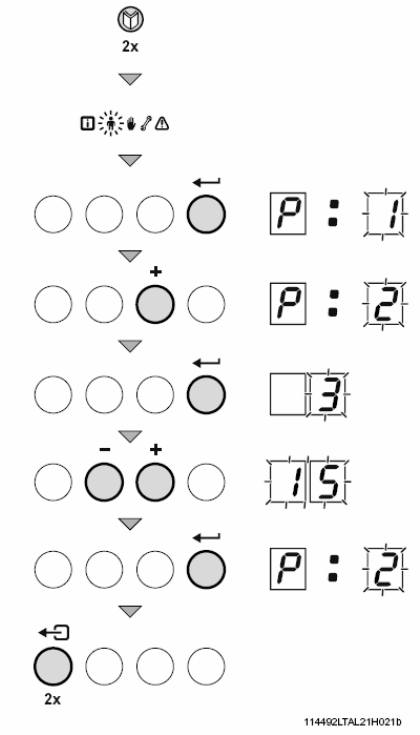


Fig. 22 Changing parameters

9.1.5 Changing parameters at user level (without access code)

The following settings can be changed at user level:

P 1 = Flow temperature set point [°F], adjustable between 68 and 194°F (20 and 90°C);

P 2 = Pump post-circulation time 0..98 mins, 99 is continuous;

P 3 = Boiler control; central heating on/off.
0 = Central heating off
1 = Central heating on (= factory setting)

P 4 = Display options
0 = Simple display
1 = Comprehensive display
2 = Display automatically goes to simple after three minutes (= factory setting)

* Consult our Technical department for further information and demands on the system.

The parameters can be changed at user level as follows:

1. Press the -key several times until the symbol flashes in the menu bar;
2. Select the users menu using the ↵-key, P:1 appears (the 1 flashes);
3. Press the ↵-key again; 3 (min) appears and flashes: (factory setting);
4. Change the value by pressing the **[-]**-key or the **[+]**-key, in this case for example to 15 min, with the **[+]**-key;
5. Confirm the value with the ↵-key, P 2 appears (the 2 flashes);
6. Press the ⏎-key twice, the boiler enters the current operating status.

The P 1 to P 4 settings can be changed in the same way as P 2.

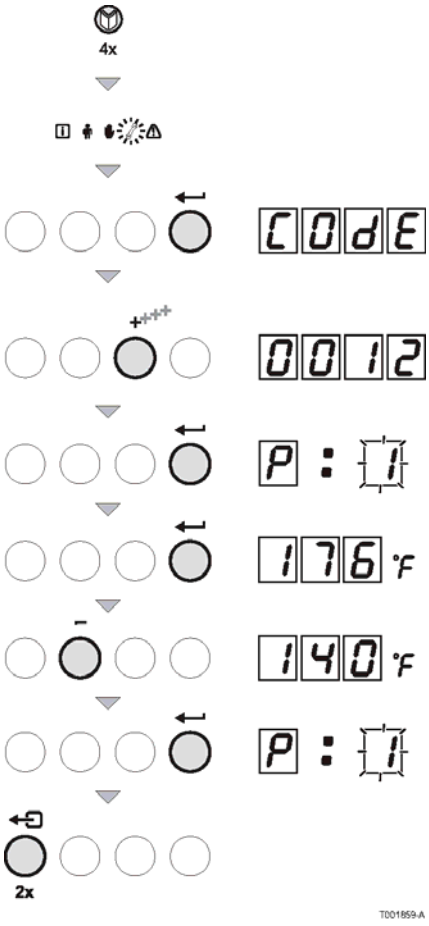
9.1.6 Changing parameters at service level (with access code)

To prevent undesired settings, some parameter settings can only be changed after the special access code 0012 is entered. This code may only be used by qualified installers.
The following settings can be changed at user and service levels:

Codes in display		Description	Setting range and possible explanation	Factory setting			
				230-80	230-120	230-160	230-200
May also be changed by users	1	Flow temperature set point	68 and 194°F (20 – 90°C)	176 (80°C)			
	2	Pump post-circulation time	0 – 98 minutes 99 = continuous	3			
	3	Boiler control	0 = Central heating off 1 = Central heating on	1			
	4	Display	0 = Simple display 1 = Comprehensive display 2 = Display automatically goes to simple	2			
Can only be changed by the installer	17	Maximum speed central heating (natural gas)	10 – 70 x 100 rpm	51	56	48	57
	18	Minimum speed central heating and hot water (natural gas)	10 – 40 x 100 rpm **Do not change ***	14	13	10	12
	19	Starting speed (natural gas)	10 – 40 x 100 rpm **Do not change ***	17			
	20	Maximum flow temperature CH	68 and 194°F (20 – 90°C)	194°F (90°C)			
	21	Base point heating curve outside temperature	32 – 86°F (0 - 30°C) (only with external sensor)	20			
	22	Baseline of flow temperature heating curve	32 - 194°F (0 - 90°C) (only with external sensor)	20			
	23	Outside temperature climate point heating curve	-22 – 32°F (-30 - 0°C) (only with external sensor)	- 15			
	24	Outside temperature for frost protection	-22 – 32°F (-30 - 0°C) (only with external sensor)	- 10			
	25	Fault relay function (available as an accessory)	0 = Operation signal 1 = Alarm signal	0			
	26	Minimum water pressure (available as an accessory)	1 - 60 (x 0.1 bar units or x 14.5 psi units) (only with water pressure sensor) 0 = off	0			
	27	Minimum gas pressure check (available as an accessory)	0 = Off 1 = On (only with a minimum gas pressure sensor)	0			
	28	Hydraulic valve running time (available as an accessory)	0 = no waiting time 1 – 255 s (only if connected)	0			
	29	Flue gas damper running time (available as an accessory)	0 = no waiting time 1 – 255 s (only if connected)	0			
	30	Maximum time for release	0 = no waiting time 1 – 255 s (only if connected)	0			
	31	VPS gas leakage control (available as an accessory)	0 = off 1 = on (only with leakage control)	0			
	32	Mains detection phase	0 = Off 1 = On	0			
	33	External interlock function (available as an accessory)	1 = Normal shutdown 2 = Shutdown without frost-protection 3 = Lock out	2			
	Ad	Automatic detection of optional hardware	0 = No 1 = Yes, once	0			
	dF	Resetting factory settings	The type plate states the value of dF (X) and dU (Y); setting these values resets the factory settings.	X			
	and dU			Y			
	34	Display units	0 = °C / bar 1 = °F / psi	1			

Table 14 Settings at service level

* Change this parameter when converting to flue gas cascade and LPG gas (please refer to De Dietrich America's).



- The parameters at service level may only be changed by a qualified installer.
- Changing the factory settings can result in incorrect operation of the C230 ECO-A.

The parameters can be changed at service level as follows:

1. Press the -key several times until the symbol flashes in the menu bar;
2. Select the installers menu using the ⟵-key, CodE appears in the display;
3. Use the **[-]**-key or **[+]**-key to set installers code 0012;
4. Confirm with the ⟵-key; P 1 appears;
5. Press the ⟵-key again; value 176°F (80°C) appears (factory setting);
6. Lower the value, for example to 140°F (60°C), with the **[-]** key;
7. Confirm the value with the ⟵-key; P 1 appears;
8. Set other parameters where required by selecting them with the **[-]** -key or **[+]** -key;
9. Press the ⟵-key twice, the boiler becomes operational.

C230 ECO-A also returns to operation if no keys are pressed for 10 minutes.

Fig. 23 Setting service code

9.1.7 Resetting factory settings

- Press the -key several times until the symbol flashes in the menu bar;
- Select the installers menu using the ↵-key, CodE appears in the display;
- Use the **[-]**-key or **[+]**-key to set installers code 0012;
- Confirm with the ↵-key; P 1 appears;
- Press the **[+]** -key several times, dF:X appears;
- By default, the current value X for dF appears on the display; as a check, compare this with the value of X on the type plate; enter the value of X on the type plate with the **[-]** key or the **[+]** key.
- Press the ↵-key again, dU:Y appears;
- By default, the current value Y for dU appears on the display; as a check, compare this with the value of Y on the type plate; enter the value of Y on the type plate with the **[-]** key or the **[+]**-key.
- Press the ↵-key to confirm the values; the factory settings have been reset.

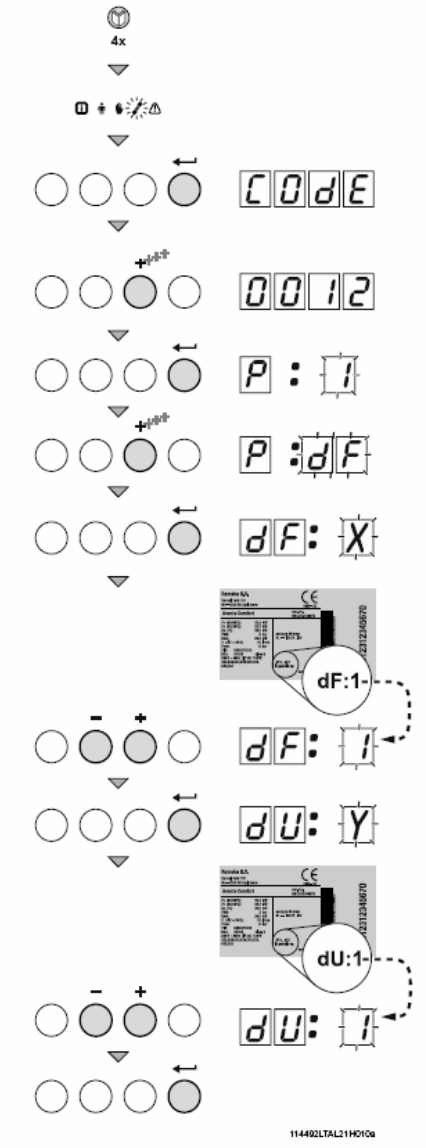


Fig. 24 Resetting factory setting

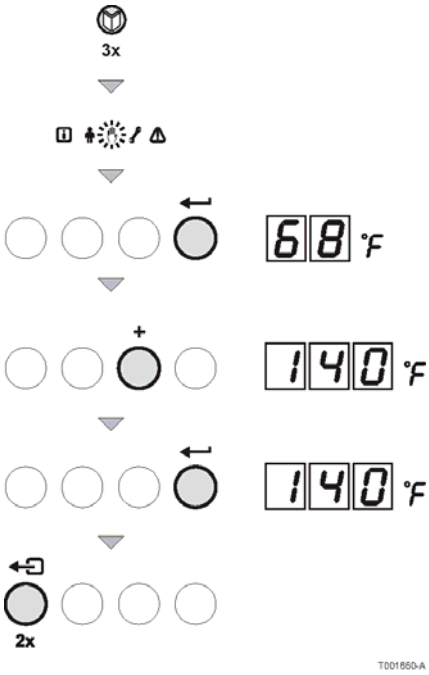


Fig. 25 Setting manual operation

9.1.8 Setting manual operation (symbol)

In some cases, it may be necessary to set the boiler to manual operation, for example when the controller has not yet been connected. The boiler can be set to automatic or manual operation under the symbol. Do this as follows:

Press the -key several times until the symbol flashes in the menu bar;
Press the ↵-key once, either the minimum flow temperature or AUto (only if an external sensor has been connected) will appear in the display; the flow temperature is determined by the internal heating curve;
or 68 °F (20°C) (minimum flow temperature) will appear in the display;
Press the **[+]** -key to increase this value in manual operation temporarily;
Confirm with the ↵-key;
The boiler is now set to manual operation;
Press the ⏎-key once to exit manual operation; the boiler enters operating status.

Manual operation keeps active after power breakdown.

9.2 Commissioning

Ensure that the boiler is disconnected from the power supply.

1. Remove front panel.
2. Open the main gas cock.
3. Check the electrical connections including earth.
4. Fill the boiler and the system with water (minimum pressure 11.6 psi (0.8 bar)).
5. Vent the system.
6. Fill the trap with clean water.
7. Check the flue gas discharge connection and air supply connection.
8. Vent the gas pipe (only vent pipework from gas isolation valve).
9. Open the gas cock in the gas pipe to the boiler.
10. Check the gas connection for leakage.
11. Switch on the mains supply to the boiler.
12. Adjust the boiler and any external controls to heat demand.
13. The boiler now starts to run.

Operation can now be monitored via the **code** window:

With a heat demand :
1 Boiler starts
2 Burner starts
3 Central heating operation; briefly in part load then in full load

When a heat demand ceases:
5 Burner stops
6 Boiler stops
0 Stand-by mode

14. Check and, if necessary, correct the gas/air ratio control setting

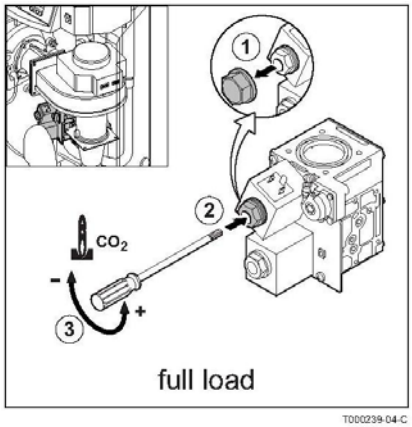


Fig. 26 Setting values CO_2

Perform the check at full load and minimum load for all boiler models. Only perform settings for the 230-80 and 230-120 models at minimum load. Perform settings for the 230-160 and 230-200 models at full load **and** minimum load. An electronic CO_2 or O_2 meter is required for checking and adjustment purposes. Check that the opening around the probe is properly sealed when measurements are taken.

15.**a** Set full load: press the key, the symbol appears in the menu bar; if H:3 appears in the display, full load has been set.

15.**b** Now measure the CO_2 percentage and compare it with the values in Table 17. If the CO_2% level deviates from these values, set the CO_2 percentage using the screw under the cap of the V2 coil on the gas block (this can only be adjusted on the 230-160 and 230-200 models). Check the flame through the inspection glass (at full load): the flame must not blow off and the burner's surface must not be red hot.

Checking and setting values O_2/CO_2 for natural gas (H) at full load								
Boiler type	Fan speed (rpm)	**CO_2**	**Control margin**	**Setting margin**	**O_2**	**Control margin**	**Setting margin**	**CO**
	Full load H:3	%	%	%	%	%	%	ppm
230-80	5100	8.8	± 0.7	n/a	5.2	± 1.3	n/a	< 100
230-120	5600	8.8	± 0.7	n/a	5.2	± 1.3	n/a	< 100
230-160	4800	8.8	± 0.5	± 0.3	5.2	± 0.9	± 0.5	< 100
230-200	5700	8.8	± 0.5	± 0.3	5.2	± 0.9	± 0.5	< 100

Table 15 Checking and setting values O_2/CO_2 for natural gas (front housing removed)

Checking and setting values O_2/CO_2 for natural gas (H) at minimum load								
Boiler type	Fan speed (rpm)	**CO_2**	**Control margin**	**Setting margin**	**O_2**	**Control margin**	**Setting margin**	**CO**
	Minimum load L:3	%	%	%	%	%	%	ppm
230-80	1400	9.3	± 0.5	± 0.3	4.3	± 0.9	± 0.5	< 100
230-120	1300	9.3	± 0.5	± 0.3	4.3	± 0.9	± 0.5	< 100
230-160	1000	9.3	± 0.5	± 0.3	4.3	± 0.9	± 0.5	< 100
230-200	1200	9.3	± 0.5	± 0.3	4.3	± 0.9	± 0.5	< 100

Table 16 Checking and setting values O_2/CO_2 for natural gas (front housing removed)

Checking and setting values O_2/CO_2 for propane (G31) at full load								
Boiler type	Fan speed (rpm)	CO_2	Control margin	Setting margin	O_2	Control margin	Setting margin	CO
	Full load H:3	%	%	%	%	%	%	ppm
230-80	5600	10.0	± 0.7	n/a	5.7	± 1.3	n/a	< 100
230-120	5600	10.0	± 0.7	n/a	5.7	± 1.3	n/a	< 100
230-160	6000	10.0	± 0.5	± 0.3	5.7	± 0.7	± 0.4	< 100
230-200	5500	10.0	± 0.5	± 0.3	5.7	± 0.7	± 0.4	< 100

Table 17 Checking and setting values O_2/CO_2 for natural gas (front housing removed)

Checking and setting values O_2/CO_2 for propane (G31) at minimum load								
Boiler type	Fan speed (rpm)	CO_2	Control margin	Setting margin	O_2	Control margin	Setting margin	CO
	Minimum load L:3	%	%	%	%	%	%	ppm
230-80	1500	10.5	± 0.5	± 0.3	4.9	± 0.8	± 0.5	< 100
230-120	1400	10.5	± 0.5	± 0.3	4.9	± 0.8	± 0.5	< 100
230-160	1500	10.5	± 0.5	± 0.3	4.9	± 0.8	± 0.5	< 100
230-200	1300	10.5	± 0.5	± 0.3	4.9	± 0.8	± 0.5	< 100

Table 18 Checking and setting values O_2/CO_2 for natural gas (front housing removed)

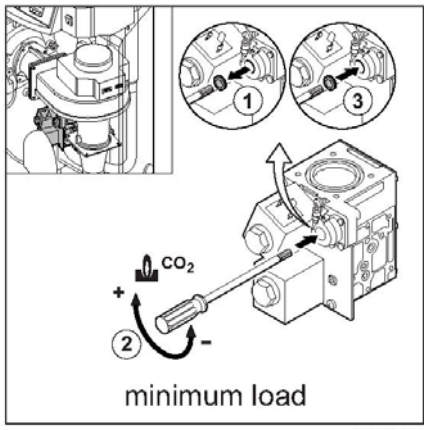


Fig. 27 Setting values CO_2 for 230-160 and 230-200

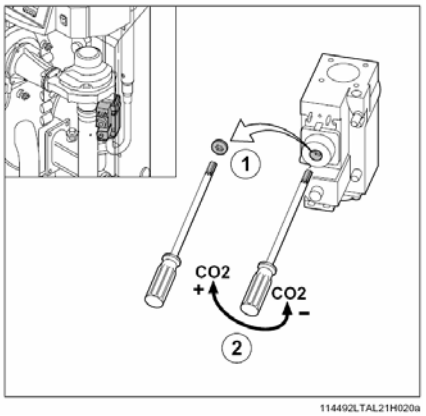


Fig. 28 Setting values CO_2 for 230-80 and 230-120 (only minimum load)

15.**c** Set minimum load: press the **[-]** -key and, when L:3 appears in the display, minimum load has been set.

15.**d** After minimum output has been reached, check the CO_2 percentage and compare it with the value in Table 18. If the CO_2% level deviates from these values, set the CO_2 percentage using the correction screw of the pressure controller on the gas block (for the 230-80 and 230-120 models, adjustments are only made at minimum load).

The boiler is supplied with a number of basic settings.
burner control - modulating on the basis of flow temperature
maximum flow temperature - 176°F (80°C)
If other values are required: see Section 8.1.6.

15.**e** Remove measuring equipment and seal measuring points.

16. Check gas leakage control (**VPS** if installed):
Then set the gas leakage control pressure switch to a switch pressure equal to 50% of the inlet pressure. Check that the measured inlet pressure is not the (higher) closing pressure.
17. Press the **reset**-key to reset the boiler to 'user level'.
18. Heat the system up to roughly 176°F (80°C) if possible and switch the boiler off.
19. Vent the system and check the water pressure.
20. The boiler is now ready for operation.
21. Set the boiler control to the required values and write down the connected type of gas on the boiler type plate: e.g. G290 – 362 psi (25 mbar).
22. Switch the boiler on.

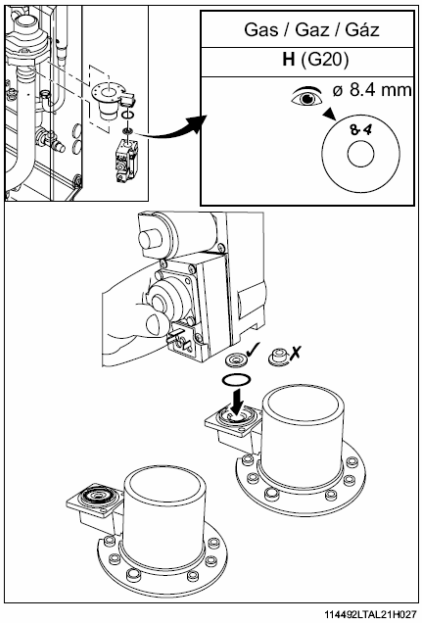


Fig. 29 Check size and positioning of restrictor

If the CO_2% with the 230-80 and 230-120 still deviates on full load:
- adjust part load (see point 15.c and 15.d)
- check full load (see point 15.b) ; if the CO_2% deviation is still too large;
- check the size and placing of the restrictor (natural gas; 8.4 mm)

The following operating modes are now available:

23.**a** **Modulating operation:** The heat output of the boiler modulates on the basis of the flow temperature demanded by the modulating controller, see 'Note' in point 22 and Section 8.1.2.

23.**b** **On/off operation:** the boiler modulates between minimum and maximum heat output on the basis of the flow temperature set in the boiler, see Section 7.3.2.

9.3 Taking the boiler out of operation

The boiler must be switched off for maintenance or repair work. If the central heating system is not going to be used for a long time (for example, during holidays in frost-free periods), it is advisable to put the boiler out of operation.

9.3.1 Boiler with frost protection, out of operation for a long time

- Set the controller low, for example to 50°F (10°C);

The C230 ECO-A will now only come into operation to protect itself against freezing, (= depending on parameter [3][3], see Table 13).

To prevent radiators and the system from freezing in rooms where there is a risk of frost (e.g. garage or storage room), a frost thermostat can be connected to the boiler. The boiler will then keep the radiators in that room warm.

This frost protection does not work if the boiler is out of operation.

9.3.2 Boiler without frost protection, out of operation for a long time

- Isolate the mains power supply from the boiler;
- Close the boiler gas cock.

Drain the boiler and central heating system if you are not going to use your home or the building for a long time and there is a chance of frost.

10 Inspection and maintenance

10.1 General

The boiler must be inspected once a year and serviced/cleaned when necessary.
The annual inspection of the boiler includes:

- **combustion check of the boiler** (the fan draws in the combustion air through the venturi. Clean the fan, venturi and burner if there are irregularities), Check the combustion air filter if fitted, replace as necessary;
- examination of venting systems;
- checking that the flow of combustion and ventilation air is not obstructed;
- cleaning the trap;
- checking the ignition electrode;
- **leakage check** (water, flue gas and gas);
- water pressure check;
- low water cut-off (LWCO) safety device check (if installed);
- checking that the boiler room is kept clear of flammable liquids and combustible materials.

Always disconnect the main power supply and close the main gas cock before working on the boiler.

Electrical Shock Hazard
Please label all wires prior to disconnecting when servicing this boiler. Wiring errors can cause improper operation and dangerous operation. Verify boiler operation after service.

Make sure that all parts are properly reassembled and resealed after inspection and maintenance.

10.2 Combustion check of the boiler

Combustion is checked by measuring the O_2/CO_2 percentage in the flue gas discharge duct. To do this, heat the boiler to a water temperature of approx. 158°F (70°C). The measurements must meet the values set in Table 17. The flue gas temperature can also be measured at the measuring point in the flue gas discharge duct. If the flue gas temperature exceeds the return temperature by more than 86°F (30°C), this can indicate that the heat exchanger is dirty. If these checks show that combustion in the boiler or heat transmission is no longer optimum, corrective maintenance must be carried out in accordance with the instructions in Sections 10.2.1 to 10.2.4.

10.2.1 Corrective maintenance

This should include cleaning the fan, venturi, the heat exchanger and the burner. These parts must be cleaned in succession. A service kit which contains gaskets and most used parts for maintenance is available as an accessory.

Work on the boiler
Disconnect the mains supply, close the main gas cock and allow the boiler to cool down before working on the boiler.

10.2.2 Cleaning the fan

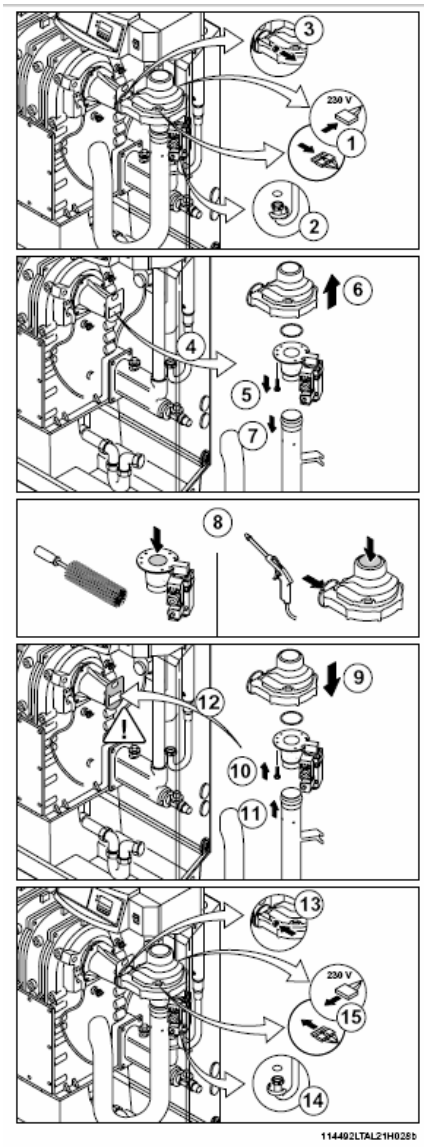


Fig. 30 Cleaning the fan 230-80 and 230-120

For the 230-80 and 230-120 versions:

1. Remove the electrical connections from the fan.
2. Unscrew the union nut under the gas multiblock (pay attention to the sealing).
3. Remove the bolts from the outlet side of the fan.
4. Remove the fan, including venturi and gas multiblock.
5. Remove the bolts on the inlet side of the fan.
6. Detach the venturi from the fan.
7. Clean the fan with a plastic brush.
8. Remove loose dust from the fan.
9. Re-attach the venturi to the fan.
10. Detach the air silencing tube from the venturi.
11. Clean the venturi with a plastic brush.
12. Refit all removed components; check the correct positioning of the gasket ring between fan and venturi.

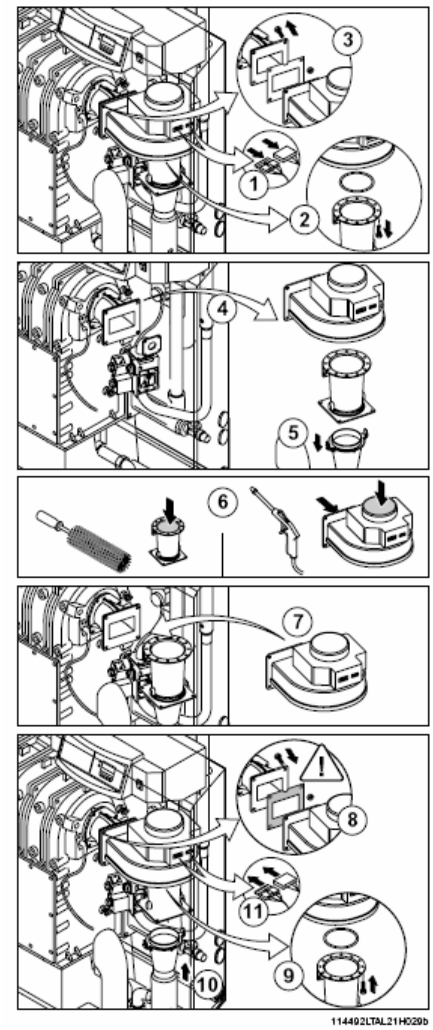


Fig. 31 Cleaning the fan 230-160 and 230-200

For the 230-160 and 230-200 versions:

1. Remove the electrical connections from the fan.
2. Remove the electrical connections from the fan.
3. Remove the bolts that fix the venturi on the fan.
4. Remove the bolts and the nuts from the outlet side of the fan.
5. Remove the fan (pay attention to the sealing).
6. Clean the fan with a plastic brush.
7. Remove loose dust from the fan.
8. Detach the air silencing tube from the venturi.
9. Clean the venturi with a plastic brush.
10. Refit all removed components; check the correct positioning of the gasket ring between fan and venturi

10.2.3 Cleaning the heat exchanger (flue gas side)

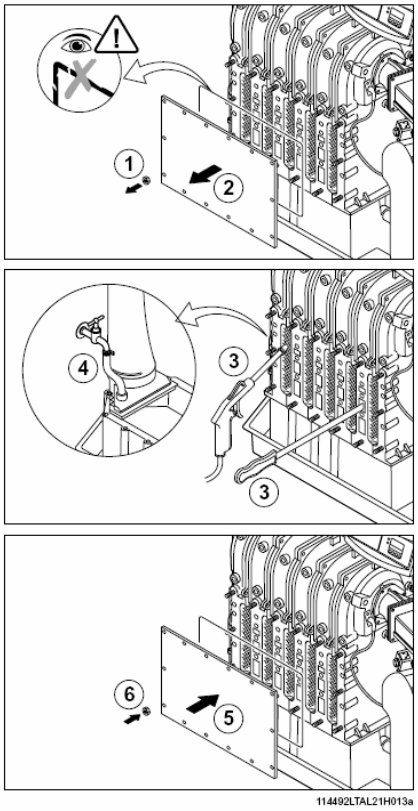


Fig. 32 Cleaning heat exchanger

Caution: The sealing between the inspection hatch and heat exchanger may stick, as may the sealing between the burner and heat exchanger. Prevent the sealing from tearing.

Damaged or hardened sealing must always be replaced.

1. Remove the nuts from the inspection hatch at the front of the heat exchanger.
2. Take the inspection hatch off the heat exchanger.
3. Clean the heat exchanger with special cleaning tool (available as an accessory) or compressed air.
4. Clean the condensate collector by removing the plug (in front of the flue gas discharge pipe) and rinsing the collector with water.
5. Now refit all removed components.

10.2.4 Cleaning the burner

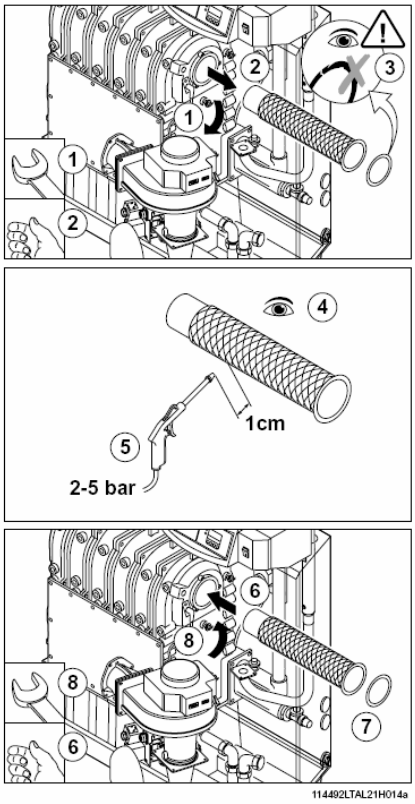


Fig. 33 Cleaning burner

1. Dismantle the burner.
2. Check burner visually and if necessary clean carefully with air (e.g. compressed air at between 30 and 70 psi (2 and 5 bar), nozzle - burner distance approx. (0,4 inch, 1 cm).
3. Now refit all removed components

Ensure that cables do not come into contact with hot boiler parts!

10.3 Cleaning the trap

Remove the trap from the boiler and clean it.
Fill the trap with fresh water and fit it.

10.4 Checking the ignition electrode

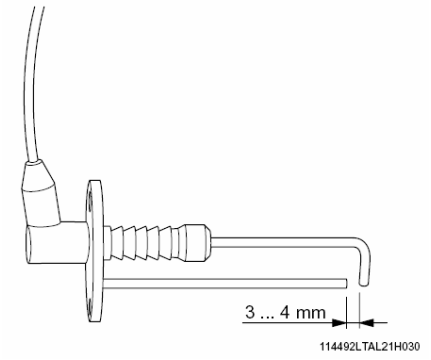


Fig. 34 Check the ignition electrode

Check the ignition electrode adjustment (between 1/8” - 1/6“, 3 - 4 mm) and replace electrode if necessary (including sealing). Also check the electrode's porcelain for hairline fractures because this may cause spark-over.

10.5 Checking for leaks

Check for water, flue gas and gas leaks.

10.6 Checking water pressure

The water pressure must be a minimum of 320” w.c. (0.8 bar). The water pressure also depends on the height of the central heating system above the boiler (static pressure, 400" w.c. (1 bar = 10 m high). It is recommended to fill the system to approx. 320” w.c. (0.8 bar) above this static pressure.

10.7 Putting boiler back into operation

1. Open the gas cock in the gas pipe to the boiler.
2. Switch on the mains supply to the boiler.
3. Adjust the boiler and any external controls to heat demand.
4. Perform another flue gas analysis (see Section 8.2 and adjust if necessary.

11 Control stops and faults

11.1 General

The boiler is fitted with an advanced control unit. The heart of the control is a microprocessor, the **Comfort Master**, which both protects and controls the boiler.

11.2 Control stops and faults

Control stop
The control stop is a (temporary) boiler operating mode due to an abnormal situation. The boiler switches to the neutral position so that it can return to a normal state. The display then shows the shutdown status (with code 9) again. The boiler control unit will, at first, try several times to start the boiler again. The boiler shall operate again when the causes of the control stop have been removed.

Fault
If the shutdown condition still exists even after various automatic control unit start attempts have been made or if a non-reproducible phenomenon has arisen, the boiler switches to fault mode (also known as lock-out). The boiler can only resume operation if the cause of the fault is rectified and the **reset-**key is pressed.

11.3 Control stop codes

The boiler display will show code 9.
The control stop codes can be read out as follows:

- Push the -key**,** and then the ↵-key;
- The display shows S E:9;
- Push the **[+]**-key one time; the display shows S and the control stop code.

The boiler shall start automatically when the causes of the control stop have been removed.

Code	Description	Possible cause	Check/solution
0	Parameter fault		• Reset dF and dU
1	Maximum flow temperature exceeded	• No flow or insufficient flow	Check: • Flow and/or reason for heat demand
3	Maximum heat exchanger temperature exceeded	• No flow or insufficient flow during heat demand	Check: • Flow (direction, pump, valves) • That the system has been correctly bled • Temperature sensors for deviations • Water pressure in the system • Whether the heat exchanger is dirty
4	Maximum heat exchanger temperature increase exceeded	• No flow or insufficient flow • Sensor fault	Check: • Flow (direction, pump, valves) • That the system has been correctly bled • Temperature sensors for deviations • Water pressure in the system • Whether the heat exchanger is dirty
5	Maximum difference between heat exchanger and return temperature exceeded	• No flow or insufficient flow during heat demand • Sensor fault	Check: • Flow (direction, pump, valves) • That the system has been correctly bled • Temperature sensors for deviations • Water pressure in the system • Whether the heat exchanger is dirty
6	Maximum difference between heat exchanger and flow temperature exceeded	• No flow or insufficient flow during heat demand • Sensor fault	Check: • Flow (direction, pump, valves) • That the system has been correctly bled • Temperature sensors for deviations • Water pressure in the system • Whether the heat exchanger is dirty
8	Waiting time release signal drift	• External cause • Incorrectly set parameter • Bad connection	• Remove external cause • Check the parameter • Check the connection
9	Phase and neutral of mains supply mixed up	• Mains supply incorrectly wired • Floating or 2-phase system	• Reconnect phase and neutral • Set parameter 32 to 0
10	Shutdown interlock active	• External cause • Incorrectly set parameter • Bad connection	• Remove external cause • Check the parameter • Check the connection
11	Shutdown interlock active or frost protection active	• External cause • Incorrectly set parameter • Bad connection	• Remove external cause • Check the parameter • Check the connection
13	Communication fault with SCU (= optional PCB)	• BUS connection inadequate or non-	• Reconnect • Carry out automatic detection

Code	Description	Possible cause	Check/solution
		existent • SCU PCB not present (any longer) in boiler	
14	Water pressure too low	• Water pressure non-existent or too low • Incorrect water pressure parameter adjustment • Water leakage	Check: • Water pressure in the system • Minimum water pressure • That hydraulic pressure sensor is properly installed /connected
15	Gas pressure too low	• No flow or insufficient flow • Incorrect GPS switch adjustment • Wiring defect or switch faulty	Check: • That the gas cock is fully opened • That there is adequate gas pressure • That the GPS switch is properly installed • Replace the GPS switch if necessary
16 *	Configuration fault or SU not recognised	• Incorrect SU PCB for this boiler	• Replace SU PCB
17 *	Configuration fault or default parameters table incorrect	• PCU-01 unit parameters incorrect	• Replace PCU-01 unit
18 *	Configuration fault or parameter storage unit (PSU) not recognised	• Incorrect PSU PCB for this boiler	• Replace PSU PCB
19 *	Configuration fault or dF-dU parameters unknown		• Add/check dF and dU
20 *	Configuration procedure active	• Standard briefly activated following boiler switch-on	• No action
21	Communication fault with SU-01	• Bad connection	• Check that the PCB is inserted in the correct connector
22	No flame during operation	• No ionization current	Check: • That the gas cock is fully opened • That the gas pressure is sufficient • That the gas block is appropriately adjusted and working correctly • Whether the air supply or flue gas discharge are blocked • The flue gas circulation; inspect the flue gas discharge system for installation faults and the heat exchanger for leaks
24	VPS test failed	• Gas pressure non-existent or too low • Faulty gas valve • Incorrect adjustment of the VPS switch • Wiring fault • Faulty VPS switch	Check: • That the gas cock is fully opened • That the gas pressure is sufficient • That the VPS switch is properly installed • Whether the gas valve is leaking or in the open position • That the wiring is OK; mix up of the V1 and V2 plugs • The adjustment of the VPS switch

Code Description	Possible cause	Check/solution
		• Replace the VPS switch if necessary • Replace the gas valve if necessary
25 Internal gas valve fault Internal fault SU-01		• Replace the gas valve if necessary • Replace SU-01
* These lock-outs are not stored in the failure memory.		

Table 19 Control stop codes

11.4 Fault codes

The boiler displays the fault codes as follows:

E:12 (the display shows the ⚠ **symbol** and the fault code flashes). The meaning of the fault codes can be found in the fault table, see Table 20.

In the event of faults, proceed as follows:

- Note the fault code.

The fault code is needed to find the cause of the fault quickly and correctly and for any support from our Customer Care Department.

- Press the **reset**-key for 2 seconds. If the fault code continues to appear, look for the cause in the following fault table and rectify the fault.

If the display does not show RESET but SERVICE, the boiler must be switched off and switched on again after 10 seconds before the fault can be reset.

Fault code	Description	Possible cause	Check/solution
E:00	Storage unit parameter not found	• Bad connection	• Check the cable bundle
E:01	Safety parameters not in order	• Bad connection	• Check the cable bundle
E:02	Heat exchanger temperature sensor short circuited	• Bad connection • Defective sensor • Sensor not correctly mounted	• Check the cable bundle • Replace the sensor if necessary • Check if sensor is correctly mounted
E:03	Heat exchanger temperature sensor open circuit	• Bad connection • Defective sensor • Sensor not correctly mounted	• Check the cable bundle • Replace the sensor if necessary • Check if sensor is correctly mounted

Fault code	Description Possible	cause	Check/solution
E:04	Heat exchanger temperature exceeded below normal range	• Bad connection • Defective sensor • Sensor not correctly mounted • No or too little flow	• Check the cable bundle • Replace the sensor if necessary • Check: • flow (direction, pump, valves) • if system has been correctly bled • temperature sensors for deviations • if sensor is correctly mounted • water pressure in the system • if heat exchanger is dirty
E:05	Heat exchanger temperature exceeded above normal range (high limit thermostat)		
E:06	Return temperature sensor short circuited	• Bad connection • Defective sensor • Sensor not correctly mounted	• Check the cable bundle • Replace the sensor if necessary • Check if sensor is correctly mounted
E:07	Return temperature sensor open circuit	• Bad connection • Defective sensor • Sensor not correctly mounted	• Check the cable bundle • Replace the sensor if necessary • Check if sensor is correctly mounted
E:08 E:09	Return temperature exceeded below normal range Return temperature exceeded above normal range	• Bad connection • Defective sensor • Sensor not correctly mounted • No or too little flow	• Check the cable bundle • Replace the sensor if necessary • Check: • flow (direction, pump, valves) • if system has been correctly bled • temperature sensors for deviations • if sensor is correctly mounted • water pressure in the system • if heat exchanger is dirty
E:10 E:11	Too great a difference between heat exchanger and return temperature	• Defective sensor • No or too little flow • Sensor not correctly mounted	• Replace the sensor if necessary • Check: • flow (direction, pump, valves) • if system has been correctly bled • temperature sensors for deviations • water pressure in the system • if heat exchanger is dirty • if sensor is correctly mounted
E:12	Trap protection activated	• Bad connection • Pressure in flue gas discharge duct is (was) too high • Air supply obstructed	• Check the cable bundle • Check that the trap is not empty; top up if necessary • Blockage in flue gas discharge/RGA covered

Fault code	Description Possible	cause	Check/solution
			• Cascade valve does not open • Trap is blocked • Heat exchanger is dirty • Check the air supply
E:14	5 failed burner starts	• No ignition spark	• Check: connection between ignition cable and transformer • electrode distance, this must be1/8 - 1/6 inch (3 - 4 mm) • breakdown to earth • condition of the burner set (burner set/electrode seal) • earthing • bad actuation on SU board
		• Ignition spark, but no flame	• Check: • is the gas cock opened? • is the inlet gas pressure sufficient? • is the gas pipe vented? • correct gas block operation and adjustment? • is the air supply or flue gas discharge blocked? • condition of cable bundle to gas block • bad actuation on SU board
		• Flame, but insufficient ionization	• Check: • condition of the electrode and earthing • condition of cable bundle between ignition cable and transformer • if gas cock is fully opened • if the gas pressure is sufficient
E:15	5 failed gas leakage controls	• Defective gas valve • No or to little gas pressure • VPS switch wrongly adjusted • Bad connection • Defective sensor • Sensor not correctly mounted	• Is the gas cock opened? • Is the gas pressure sufficient? • Are the VPS switches correctly fitted? • Gas valve is leaking or is stuck in the open position. • Is the wiring in order, plugs V1, V2 not mixed up? • Check the VPS settings • Replace the sensor if necessary • Check if sensor is correctly mounted
E:16	False flame signal	• Ionization current has been measured, while there may not be a flame	• Burner glows as a result of a high CO_2 percentage (adjust CO_2). • Check the ignition / ionization electrode • Gas valve is leaking or is stuck in the open position.

Fault code	Description Possible	cause	Check/solution
E:17	Gas valve control fault	• Bad connection • Defective gas valve	• Check the cable bundle • Replace the gas valve if necessary
E:32	Flow temperature sensor short circuited	• Bad connection • Defective sensor • Sensor not correctly mounted	• Check the cable bundle • Replace the sensor if necessary • Check if sensor is correctly mounted
E:33	Flow temperature sensor open circuit	• Bad connection • Defective sensor • Sensor not correctly mounted	• Check the cable bundle • Replace the sensor if necessary • Check if sensor is correctly mounted
E:34	Fan fault	• Bad connection • Defective fan	• Fault in fan cabling • Defect in fan • (Too) much draught over boiler, so that the fan starts to rotate
E:35	Flow and return swopped	• Defective sensor • Wrong flow direction • Bad sensor connection • Sensor not correctly mounted	• Check: • Flow direction • temperature sensors for deviations • Replace the sensor if necessary
E:36	Flame loss occurs 5 times	• Ionization current drops out	• Inlet gas pressure sufficient? Inlet gas pressure controller in order? • Correct gas block operation and adjustment? • Blockage in air supply or flue gas discharge? • Flue gas circulation, check flue gas system for installation faults and the heat exchanger for possible leaks
E:37	Communication fault with SU board	• Bad connection	• Check SU board is correctly inserted in the connector on the PCU-01
E:38	Communication fault with SCU board (optional)	• Bad connection	• Check the cable bundle
E:39	Shutdown input in locked-out mode	• External cause • Incorrectly set parameter • Bad connection	• Remove external cause • Check the parameter • Check the cable bundle

Table 20 Fault codes

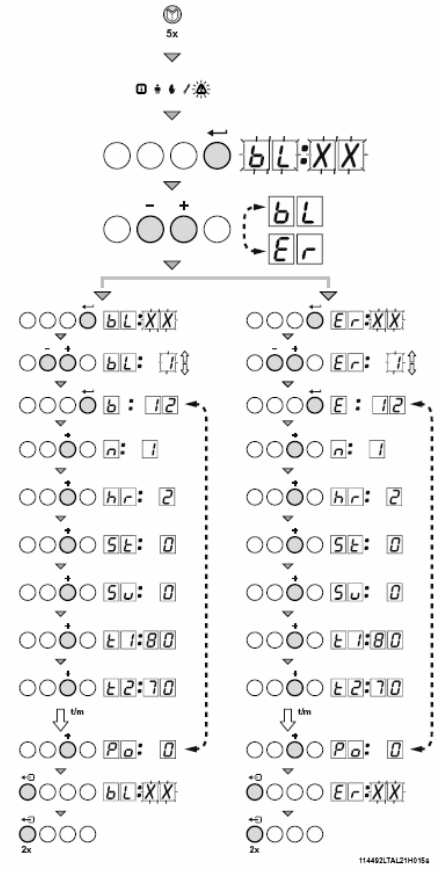
11.5 Control stop - and fault memory

The boiler control unit has a control stop and fault memory. This stores the last 16 control stops and the last 16 faults that have occurred.

With each fault, the following data is saved:
– b or E = control stop or fault code

- n = number of times that the fault has occurred in succession
- Hr = burner operating hours since time of fault
- St = status
- Su = sub status
- t1 = flow temperature [°F]
- t2 = return temperature [°F]
- t4 = outside temperature [°F]
- t6 = boiler block temperature [°F]
- SP = internal set point [°F]
- FL = ionization current [µA]
- nF = fan rotation speed [rpm]
- Pr = water pressure [inches w.c.]
- Po = relative output supplied [%]

11.5.1 Reading faults



- Press the -key several times until the symbol flashes in the menu bar;
- Press the ↵-key; bL:XX will flash in the display, together with the number of shutdowns that have been memorised;
- Press the **[+]** or **[-]**-key to select either the control stops bL or faults Er.
- Press the ↵-key; bL:XX will flash in the display, together with the number of shutdowns that have been memorised;
- Press the **[+]** or **[-]**-key to go forwards or backwards in the list of faults.
- Press the ↵-key to take a closer look at the fault.
  Press the **[+]** or **[-]**-key to view the following information:
  b:12 (shut down code b with fault number e.g. 12);
  St:3 (status code t with number e.g. 3; appliance burned for central heating); n:1 number of n with the 'number of times that the fault has occurred' as number);
  t1:170 (temperature t1, the flow temperature 170 when the fault occurred); t2:160 (temperature t2, the return temperature 160 when the fault occurred);
- Press the ⇤-key to stop the cycle, bL:XX will appear flashing in the display with the number of the last fault;
- Press the **[+]** or **[-]**-key to view any subsequent fault information.

Fig. 35 Reading faults or control stops

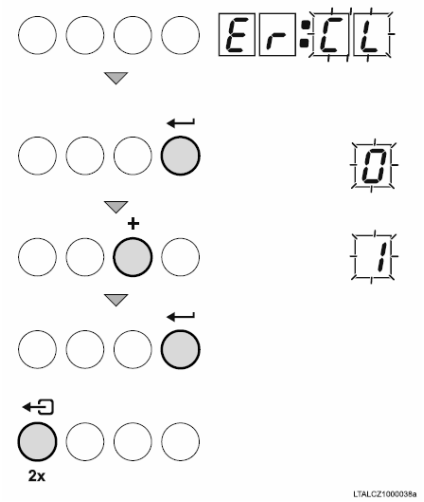


Fig. 36 Deleting faults

11.5.2 Deleting control stops or faults

The last message in the list in the display is Er:CL (or bL:CL with shutdowns)

- Press the ↵-key; the display will show: 0
- Press the **[+]**-key to set the parameter to 1.
- Press the ↵-key; the fault memory is cleared
- Press the ↵-key twice to exit the fault memory.

With faultfinding, retrieving the operating status when the fault occurred can contribute to faster rectification of the cause.

12 Service parts

12.1 General

If it is ascertained during the annual inspection or maintenance work that a part in the boiler must be replaced, use only original parts or parts and materials recommended by De Dietrich America's.

Send the part to be replaced to De Dietrich America's. Always send a fully completed return form as well, see example. In this way, De Dietrich America's can handle its guarantee obligations faster and more efficiently.

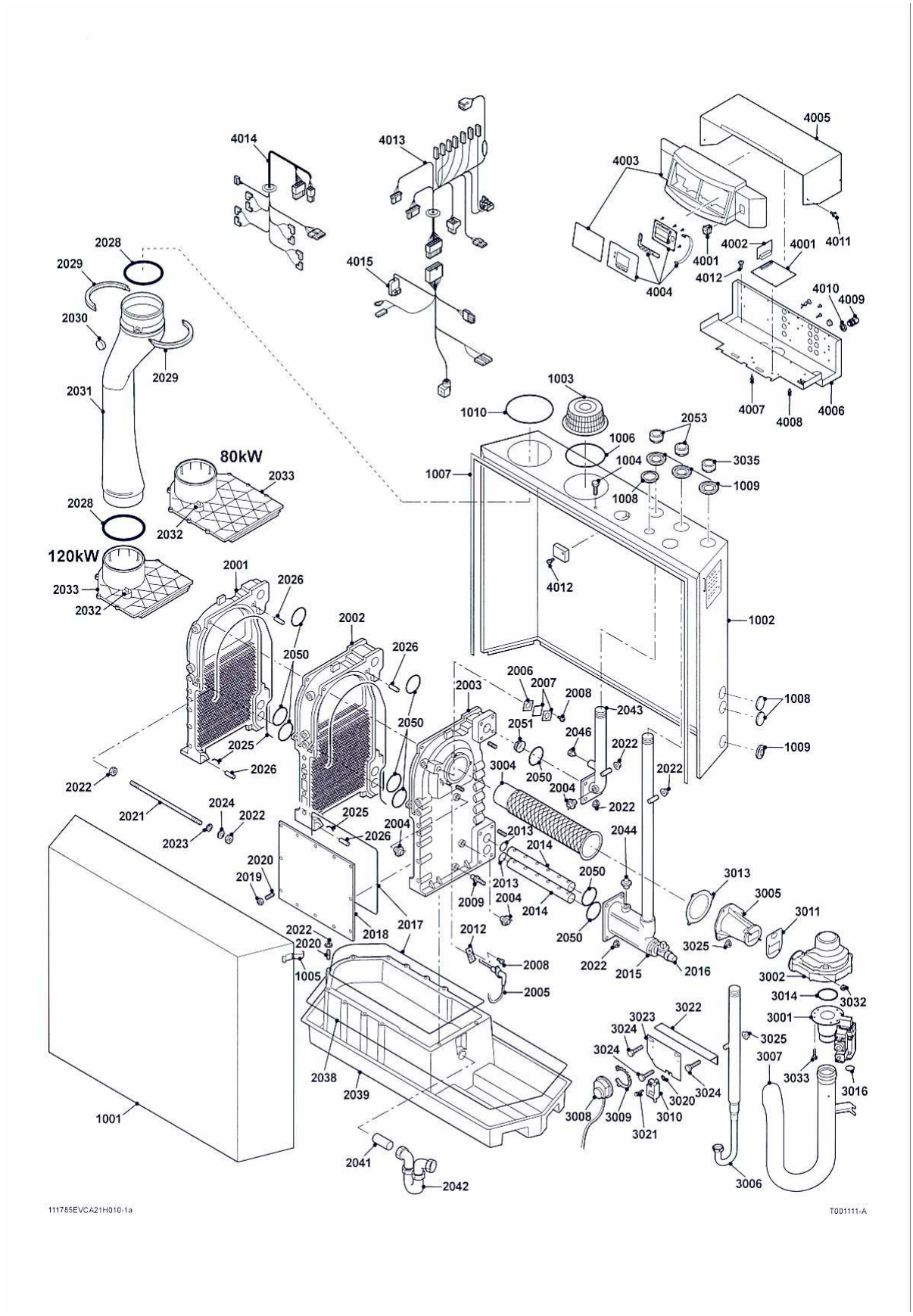
Your reference		Date	
Customer			
Name			
Address			
Zip code / city			
Telephone			
Contact person			
Job number			

Part. no.	Description	Boiler serial nr.*	Model	Installation date	Problem description	Reference

Table 21 Return form sample

* This data can be found on the boiler type plate; the type plate is stuck to the top of the boiler's right side panel.

12.2 Exploded views



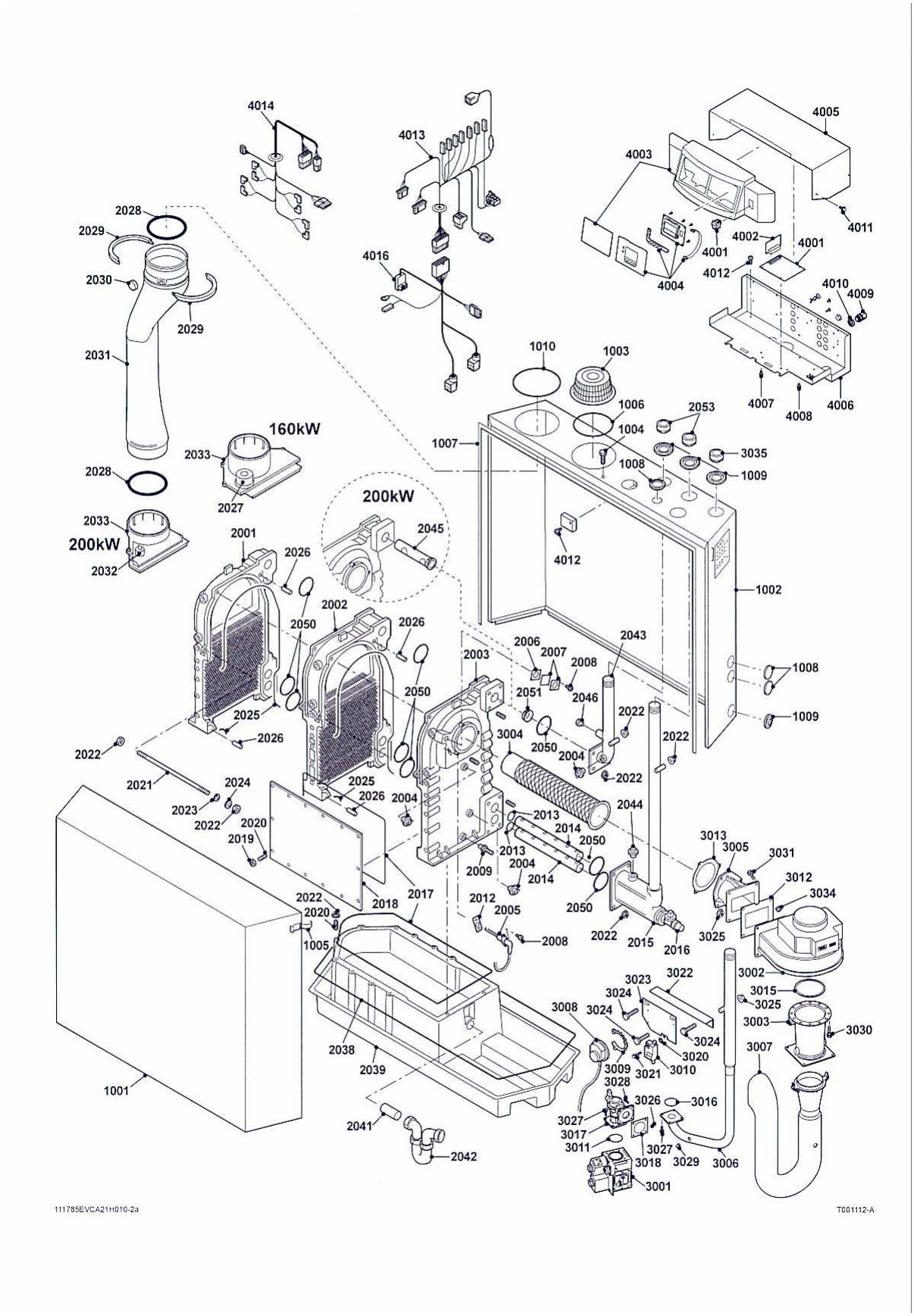


Fig. 37 Exploded views

Part #	Description	Item #
	Boiler casing	
S100607	Front panel	1001
S100610	Rear panel	1002
S100599	Air supply basket	1003
S100534	Screw M6x50 (5 pc's)	1004
S100553	Sealing ring Ø 150	1006
S100291	Gasket strip Neoprene 20x6 mm (10 m)	1007
S100539	Grommet Ø 60 mm (5 pc's)	1008
S100614	Grommet set (red, blue, yellow)	1009
S100603	Sealing slip ring Ø 160	1010
	Boiler heat exchanger	
S52481	Section left hand end	2001
S52482	Section intermediate	2002
S52480	Section right hand end	2003
S57040	Service set plug ¾"(5 pc's)	2003
S44698	Temperature sensor Elmwood NTC 12K/007	2004
S100604	Electrode ignition/ionization	2005
S35458	Gasket for sight glass (5 pc's)	2006
S100554	Inspection glass including mounting frame	2007
S100535	Screw M4x8 (10 pc's)	2008
S100592	Hose pillar Ø 6mm - 3/8"	2009
S53489	Gasket for electrode ignition/ionization (10 pc's)	2012
S100550	O-ring 37.69x3.53 (10 pcs)	2013
S100557	Return water distribution pipe length 270 - 80 kW	2014
S100558	Return water distribution pipe length 370 - 120 kW	2014
S100559	Return water distribution pipe length 470 - 160 kW	2014
S100560	Return water distribution pipe length 570 - 200 kW	2014
S100582	Return connection	2015
S55703	Filling and draining cock	2016
30629	Round cable silicon rubber red (per meter)	2017
S100545	Front plate heat exchanger - 80 kW	2018
S100547	Front plate heat exchanger - 160 kW	2018
S100548	Front plate heat exchanger - 200 kW	2018
S100546	Front plate heat exchanger - 120 kW	2018
S100556	Nut hexagonal M8 (25 pc's)	2019
S100549	Pin M8 (25 pc's)	2020
S100561	Tie rod set m08 - 3 sections	2021
S100562	Tie rod set m08 - 4 sections	2021
S100563	Tie rod set m08 - 5 sections	2021
S100564	Tie rod set m08 - 6 sections	2021
S44483	Nut hexagonal M8 (10 pc's)	2022
S100088	Washer Ø 8,4mm (25 pc's)	2023
S100538	Spring dish Ø 20x8.2x1.0 (20 pc's)	2024
35208	Tapakit cement	2025
S100543	Fitting pen Ø 8 x 20 (10 pc's)	2026
S62122	Sealing cap 60 mm	2027
S100603	Sealing slip ring Ø 160	2028
S100600	Clamp piece for flue gas outlet pipe	2029
S62288	Grommet for flue gas discharge pipe	2030
S100593	Flue gas discharge pipe	2031
S100591	Sealing cap	2032

Part #	Description	Item #
S100588	Top cover for condensate receiver tank 120 kW	2033
S100589	Top cover for condensate receiver tank 160 kW	2033
S100590	Top cover for condensate receiver tank 200 kW	2033
S100587	Top cover for condensate receiver tank 80 kW	2033
S100291	Gasket strip Neoprene 20x6 mm (10 m)	2038
S100542	Bottom frame (polyester)	2039
S100536	Pipe PVC	2041
S100552	Siphon model "P" Ø 32	2042
S100586	Forward connection	2043
S100532	Plug 3/8"	2044
S100567	Boiler flow distribution pipe	2045
S100533	Plug 1/2"	2046
S100544	O-ring 50.17x5.33 (10 pc's)	2050
S100566	Adapter ring	2051
S100565	Adapter ring 241 1.1/2x5/4	2052
	Premix burner	
S100575	Gas multiblock VRB20VA1001 (160/200 kW)	3001
S100617	Venturi - gas multiblock assembly	3001
S100573	Venturi - gas multiblock assembly (80/120 kW)	3001
S100611	Fan EBM G1G170 5-6 sections	3002
S100576	Fan RG148 3-4 sections	3002
S100574	Venturi assembly	3003
S53553	Burner 3 sections - 80 kW	3004
S53554	Burner 4 sections - 120 kW	3004
S53555	Burner 5 sections - 160 kW	3004
S57988	Burner 6 sections - 200 kW	3004
S100581	Mixing chamber/pipe 160-200 kW	3005
S100580	Mixing chamber/pipe 80-120 kW	3005
S100616	Pipe gas supply 160-200 kW	3006
S100579	Pipe gas supply 80-120 kW	3006
S100598	Air intake damper 160-200 kW	3007
S100597	Air intake damper 800-120 kW	3007
S100613	Air pressure switch Huba 605.99772	3008
S100618	Retaining ring	3009
S100572	Ignition transformer	3010
S56151	Sealing plate for fan	3011
S100632	Sealing plate (5 pc's)	3012
S100551	Gasket for burner (1 pc)	3013
S100058	O-ring 70x3 mm (5 pc's)	3014
S100305	O-ring 110x3.5 mm (5 pc's)	3015
S100056	Gasket ring Ø 27x20x2,5 mm (5 pc's)	3016
S100585	Gas pipe elbow	3017
S100624	Sealing plate for venturi (5 pc's)	3018
S100619	O-ring Ø 52.39x3.53 (5 pc's)	3019
S21473	Toothed spring ring	3020
S14254	Self tapping screw 4,2x9,5 (20 pc's)	3021
S100602	Angle	3022
S100601	Mounting plate for trafo	3023
S100541	Bolt M8 x 60 (5 pc's)	3024
S44483	Nut hexagonal M8 (10 pc's)	3025
S46687	Nut flange M5 (10 pc's)	3026
S100537	Bolt M5 x 12 (10 pc's)	3027

Part #	Description	Item #
S100570	Bolt M5 x 20 (10 pc's)	3028
1035	Pressure test nipple 1/8"	3029
S15524	Bolt M8 x 16 (10 pc's)	3030
S100531	Bolt M8 x 30 (10 pc's)	3031
S100055	Nut M5 (20 pc's)	3032
S100054	Screw DIN912 M5x16 (20 pc's)	3033
S59818	Nut M8 (20 pc's)	3034
	Control	
S100578	Print PCU-01+ SU-01	4001
S100577	Print SU-01	4002
S100595	Front cover instrument panel + HMI panel	4003
S100594	Front cover instrument panel	4003
S100569	Display complete	4004
S100568	Display complete	4004
S100496	Top cover instrument panel	4005
S100596	Mounting plate for instrument panel	4006
S100584	Spacer	4007
S100583	Spacer cap	4008
S56698	Cable gland M20 (10 pc's)	4009
S56696	Nut for cable gland M20 (10 pc's)	4010
S100612	Sheet-metal screw 4.2X8 (20 pc's)	4011
S14254	Sheet-metal screw 4.2X 9.5 (20 pc's)	4012
S100625	Cable set 230 V	4013
S100605	Cable set 24V	4014
S100626	Cable set 230V - 3,4	4015
S100627	Cable set 230V - 5,6	4016
S59277	On/off switch (5 pc's)	4017

13 Technical specifications

13.1 Technical data

Boiler type	Unit	De Dietrich C230 Eco-A Series			
		C230-80 3 Section	**C230-120** 4 Section	**C230-160** 5 Section	**C230-200** 6 Section
General					
Firing sequence operation		**On/off, 2 stage or fully modulating**			
Minimum fuel input	MBH [kW]	65 [19]	80 [24]	136 [40]	164 [48]
Maximum fuel input	MBH [kW]	325 [95]	400 [117]	680 [199]	820 [240]
Minimum heat output	MBH [kW]	63 [24]	78 [25]	133 [33]	160 [44]
Maximum heat output	MBH [kW]	317 [93]	390 [114]	663 [179]	800 [234]
Efficiency					
Combustion (gross)	%	CSA certified avg. 96.0 - [potential up to = 99.0]			
Thermal efficiency (net)	%	97.4 - [potential up to = 97.6]			
Standby losses (average)	%	< 0.3			
Gas & Venting					
Gas type	Type	Natural gas, propane (LPG) - LNG consult factory			
Gas inlet connection size	BSP inch	Adapter required 1¼" BSP to 2" NPT			
Gas inlet pressure range	inches w.c. [mbar]	3.5- 14 [8.7 – 35]			
NO_X emissions (O_2 = 0%, dry)	ppm	< 20			
Residual fan duty	inches w.c.[mbar]	0.48 [1.2]	0.48 [1.2]	0.48 [1.2]	0.48 [1.2]
Flue gas vent diameter	Inch [mm]	6 [150] (special vent starting adapter required)			
Combustion air vent diameter	Inch [mm]	6 [150] (special vent starting adapter required)			
Flue-gas mass range	lb/h [kg/h]	79-330 [36-150]	81-390 [37-177]	109-631 [50-286]	144-760 [66-345]
Gas vent category	types	ANSI Z21.13/CSA 4.9 Gas vent category II or IV - special venting type BH only			
Max. flue gas temp. @ 104/86°	°F [°C]	110/43			
Condensate drain connection	Inch [mm]	1.25 [32]			
Water					
Heating return	inch	Adapter required 1¼" BSP to 2" NPT			
Heating supply	inch	Adapter required 1¼" BSP to 2" NPT			
Maximum water temp. safety limit	°F [°C]	230 [110]			
Water temperature operating range	°F [°C]	68 – 194 [20 – 90]			
Water pressure range	psi [bar]	11.6 - 100 [0.8 - 6.89] ASME MAWP 100			
Boiler water content	gallons [litres]	3.2 [12]	4.2 [16]	5.3 [20]	6.3 [24]
Water resistance at d T = 36 °F [d T = 20 °C]	ft. H_2O [mbar]	5.52 [165]	4.52 [135]	5.69 [170]	6.02 [180]
Heating Surface area (wetted)	ft²/m²	9.5/0.88	14.2/1.32	18.9/1.76	23.7/2.2
Electrical					
Main supply	V/P/H	120/60/1 (+10% -15%) <15A max. fuse disconnect			
Power consumption (w/o pump)	watt	4 - 125	4 - 193	4 - 206	4 - 317
IP-IEC-NEMA protection	Rating	IP 20 [NEMA type1]			
Other					
Combustion air temperature	°F [°C]	-4 to104 [-20 to 40]			
Installation altitude	ft. [m]	4,500 [1370]			
Dry boiler weight	Lb [kg]	254 [115]	298 [135]	364 [165]	414 [188]
Floor area	ft^2 [m^2]	5.8 [0.54]			
Noise level at 1m [average]	dB(A)	59			
Colour of casing	RAL	9003 (front cover), 7011 (rear cover), 7038 (control housing)			

Table 22 Technical data

14 Efficiency information

14.1 Unit usable efficiency (HR efficiency)

Up to 108.4% with respect to Hi at T_{Return} = 86°F (30°C).

14.2 Water-side efficiency

a. Up to 97.6% with respect to Hi at full load at an average water temperature of 158°F (176/140°F) (70°C (80/60°C)).

b. Up to 105.7% with respect to Hi at full load an average water temperature of 104°F (122/86°F) (40°C (50/30°C)).

14.3 Zero-load losses

Approx. 0.21% with respect to Hi at an average water temperature of 113°F (45°C).

15 Ge neral information

15.1 Description of specifications

High efficiency gas boiler
- Modulating (20 - 100%) or 0-10V or 0-20 mA or on/off control is optional.
- Suitable for use with natural gas and propane.
- Average boiler housing noise level at 1 m distance around boiler ≤ 59 dBA
- Heat exchanger made of cast aluminium sections.
- Cylindrical, stainless steel, premix burner with metal fibre cover.
- Air supply fan.
- Flue gas pressure difference switch.
- Temperature control: adjustable between 68 – 194°F (20 - 90°C).
- Low water level protection using temperature sensors.
- Gas/air mixing system (venture).
- Gas multiblock (120 V)
- Electronic control and protection equipment: 120 V.
- Fan; 120V
- Pump switch: on/off 120 V max. 300 VA.
- Frost protection.
- Filling and drain cock.
- Trap.
- Suitable for both room ventilated and room sealed versions.
- Sheet steel casing, off the ground.
- Plastic condensate collector.
- Boiler equipped with closed air box.
- Boiler fully pre-wired with built-on control box.
- Installation option for boiler controllers.
- Suitable for OpenTherm controllers.
- Supplied with internal heating curve.
- Well laid-out instrument panel with LCD display.
- Menu-controlled microprocessor boiler control with operating and servicing diagnostics.

Available in 4 models:
- C230 ECO-A 80
- C230 ECO-A 120
- C230 ECO-A 160
- C230 ECO-A 200:

15.2 Accessories

- Air supply filter
- Cleaning knife
- 0 - 10 V control PCB (IF-01).
- 0 - 20 mA control PCB.
- Expanded control/protection PCB (SCU-S01).
- Outside temperature sensor* (only possible in combination with SCU-S01 PCB).

- Flue gas temperature switch* (only possible in combination with SCU-S01 PCB).

* Only one PCB (SCU-S01) board is needed for one or all of these options.

15.3 Services

The following services can be supplied by De Dietrich America's:
- Initial commissioning.
- Warranty support.
- Access to list of De Dietrich America's trained and approved service companies.

Please contact our Technical department for further information on certified maintenance and inspections.

16 Application data

16.1 General

The boiler is suitable for a wide range of applications. The boiler offers numerous flue gas, hydraulic, gas and control application options, but, at the same time, is not complicated to install. This and its moderate dimensions, low noise levels and cascade options mean the boiler can be installed almost anywhere (for general legal requirements, see Section 12.2).

16.2 Air and flue gas application options

The choice of versions (open or closed combustion air supply) provides excellent siting flexibility for the boiler. A motorised flue gas discharge valve is available as an accessory and is used for overpressure flue gas cascade arrangements. The boiler is equipped with an enclosed housing that also serves as an air box. An air filter and connection set are available for situations in which the boiler has to be commissioned during the construction phase or has to operate in a heavily polluted environment (this only applies to room ventilated versions). Direct connection to structural ducts is not acceptable because of condensation, see Chapter 7 for instructions and flue gas discharge tables.

16.3 Hydraulic application options

The advanced boiler control Comfort Master and relatively low hydraulic resistance ensures that the boiler can be used in virtually any hydraulic system.

16.4 Control options

The following types of control can be used for the boiler:
- as a single boiler or in a cascade with modulating controllers based on room and/or outside temperature
- on/off controllers, using the boiler's internal heating curve if necessary (in combination with outside temperature sensor)
- high/low controllers
- analogue signals (0-10 V or 0 - 20 mA) for control based on output or flow temperature.

For further details, see Section 7.4.3.

16.5 Gas application options

The boiler is suitable for use with natural gas category II_{2H3P}. For further data, see Chapter 6.

17 Checklist s (records)

17.1 Checklist for commissioning (Commissioning record)

Commissioning work, see Section 9.2	Measured value or confirmation
1. Fill the central heating system with water. Check the water pressure in the central heating system.	O
2. Fill trap with water.	O
3. Vent central heating system	O
4. Check circulation pump operation	O
5. Check water-side connections for tightness	O
6. Check type of gas offered (Does the type of gas offered correspond to the type of gas for which the boiler is suited?)	O Natural gas G20/G25/propane Wobbe index …….btu/feet^3 (kWh/m$^{3)}$
7. Check the gas supply pressure	O
8. Check gas meter capacity	O
9. Check the gas tightness of the connections and the gas pipes	O
10. Vent gas supply pipe	O
11. Check electrical connections	O
12. Air supply and flue gas discharge connections checked	O
13. Check function and operational status of the boiler	O
14. Check whether the gas/air ratio control is correct	O
15. Measuring equipment removed and cap refitted on flue gas measuring point	O
16. Refit boiler front housing again in the proper manner	O
17. Write type of gas on the boiler type plate	O
18. Set room thermostat or boiler control to desired value	O
19. Instruct user and hand over the necessary documents	O
20. Confirmation of commissioning (Company name, signature of engineer)	Date:

Table 23 Commissioning record

17.2 Checklist for annual inspection (inspection record)

Inspection work, see Chapter 10	Confirmation and date								
1. Water pressure checked									
2. Air supply and flue gas discharge connections checked									
3. Ignition electrode checked									
4. Combustion checked									
5. Heat exchanger (central heating) checked									
6. Check the venturi for corrosion									
7. Confirmation of inspection (signature of engineer)									

Table 24 Inspection record

17.3 Checklist for maintenance (maintenance record)

Maintenance work (see Section 10)	**Confirmation and date**								
1. Ignition electrode checked									
2. Heat exchanger (central heating) cleaned									
3. Combustion checked									
4. Water pressure checked									
5. Air supply and flue gas discharge connections checked									
6. Check the venturi for corrosion									
7. Burner checked									
8. Confirmation of maintenance (signature of engineer)									

Table 25 Maintenance record

The manufacturer:

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Postbus 32
7300 AA APELDOORN, NL
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Internet: www.nl.remeha.com
E-mail: remeha@remeha.com

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